ENGINEERING AND MINING JOURNAL

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JANUARY 1955

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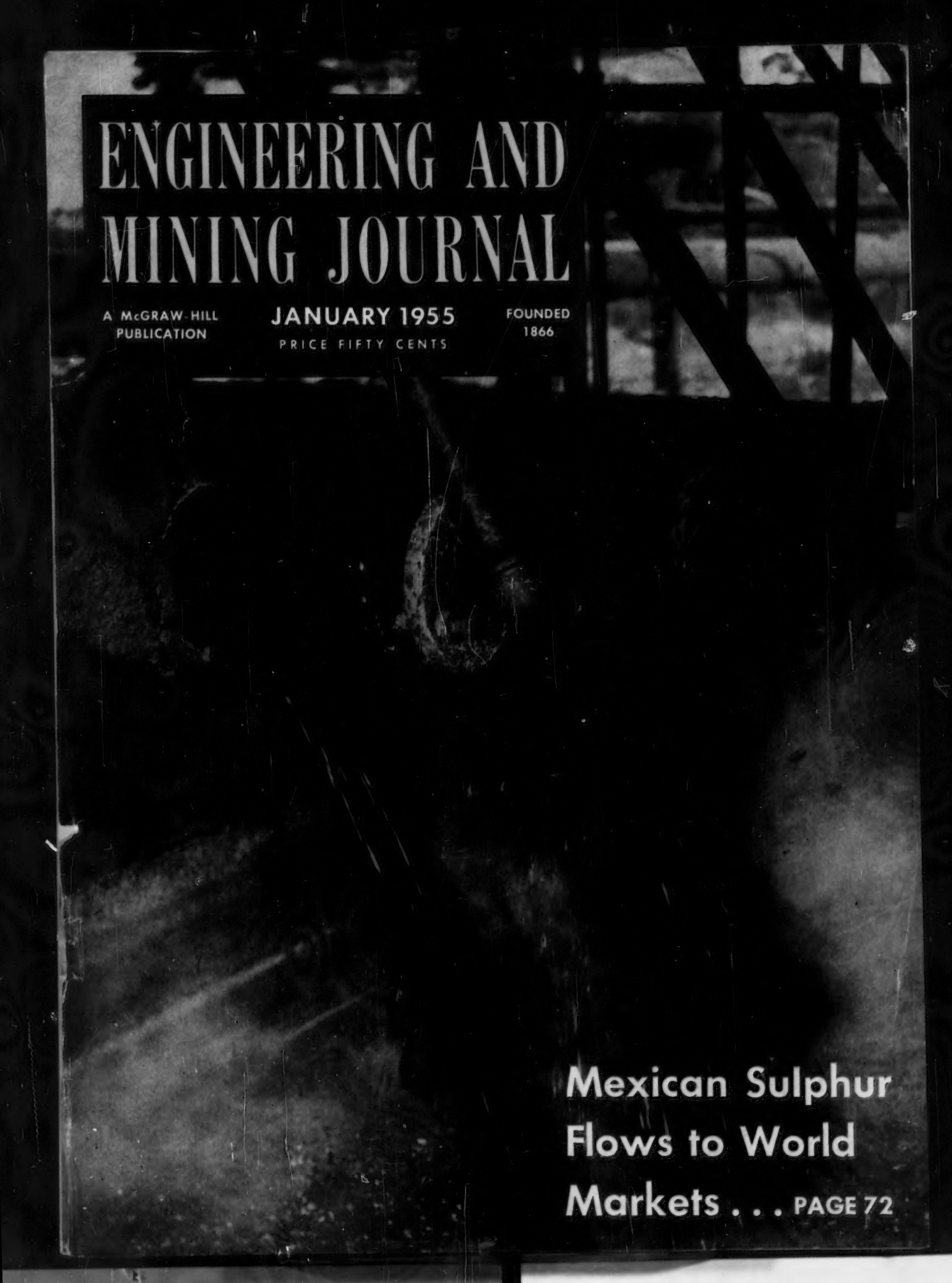


Mexican Sulphur Flows to World Markets . . . PAGE 72

New pumps for Old

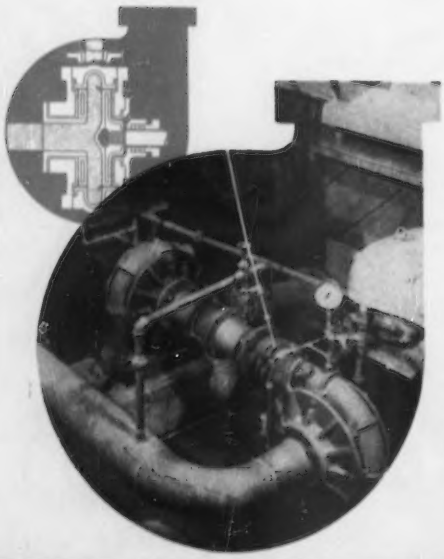
may cost you nothing!

Operating Costs → *Future Savings*

OLD	PUMPING EQUIPMENT	NEW	HYDROSEALS

1/3 to 1/2 less power
Less maintenance costs

If you have old equipment pumping abrasives, it's time you check the operating cost—including power consumption, renewal of parts and downtime for repair. You may well find that excessive costs over a few months equal your capital investment. That revelation will mark your opportunity to improve your pumping and cut future operating costs . . . with efficient, economical Hydroseals.



Because a flow of seal liquid protects the close clearance from abrasives, Hydroseals maintain their initial high efficiency throughout pump life. Since over-size pumps & motors are not needed as allowance for wear, you'll use ⅓ to ½ less power than with other new pumps. Furthermore, the Maximix Rubber parts will outlast metal equivalents 4 to 6 times, and cost less.

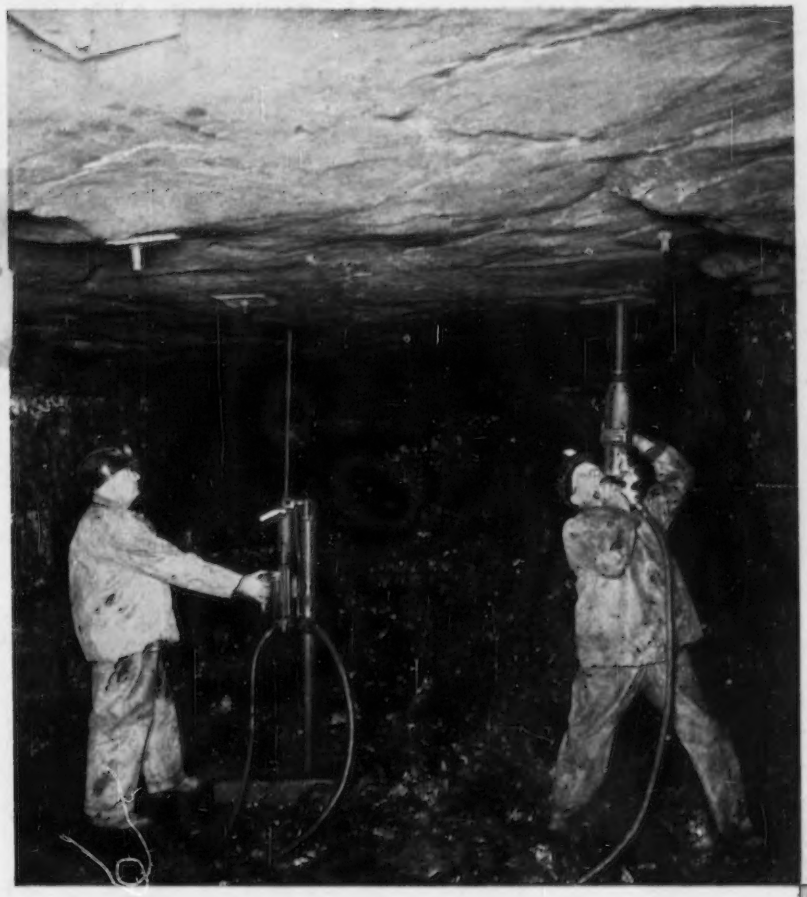
To figure future savings by comparing the present B.H.P. with that of the required Hydroseals, write for Hydroseal Catalog No. 953.

THE ALLEN-SHERMAN-HOFF PUMP CO.
Dept. B—259 E. Lancaster Ave., Wynnewood, Pa.
Representatives throughout the World

HYDROSEAL and CENTRISEAL
SAND, SLURRY & DREDGE PUMPS
MAXIMIX RUBBER PROTECTED

Markets . . . PAGE 72

EVERYTHING you need for ROCK BOLTING



from bit to compressor

CARSET JACKBITS

RP-38 "SHORT LEG" STOPERS

SIZE 534 IMPACT WRENCH

TYPE 40 COMPRESSORS

Ingersoll-Rand equipment helps you do a better job at rock bottom cost

CARSET JACKBITS last longer and drill more feet of hole between regrinds. They cut bolt-hole drilling time 50% or more.

RP-38 "SHORT LEG" STOPERS are easy on the operator. They make light work of drilling bolt holes and driving wedge-type bolts. Available with standard or telescopic feed leg.

SIZE 534 IMPACT WRENCH tightens all roof bolts quickly and easily—without kick or twist to the operator. Wide range of extra-deep sockets permits tightening nuts over extended bolt ends.

TYPE 40 COMPRESSORS provide an ideal air power source for rock bolting work. These compact, electric-driven, two-stage units require no cooling water—no permanent foundations. Dust-tight, economical, easy to install or move about. Available in sizes 25 to 100 hp for pressures from 80 to 125 psi.

FREE — NEW ROCK BOLTING HANDBOOK

This new 12-page booklet contains up-to-the-minute information on rock bolting methods, applications and equipment. Ask your I-R representative for a copy—or write to Ingersoll-Rand for Bulletin 4155.

S-87

Ingersoll-Rand
11 Broadway, New York 4, N. Y.

ROCK DRILLS • COMPRESSORS • AIR TOOLS • CENTRIFUGAL PUMPS • TURBO BLOWERS • DIESELS • OIL & GAS ENGINES

ENGINEERING AND MINING JOURNAL

89th YEAR OF PUBLICATION

VOL. 156 NO. 1

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LETTERS

Good Man On A Trip

Sir:

Recently received a letter from my sister-in-law (widow of champion hand driller Fred Yockey) with notice of the death of Lew Yockey, 82, of Paradise, Calif., Fred's brother.

Lew did a lot of digging in the San Juan, but had been in California for the past 30 years or more. Several years ago he dug into a rich surface pocket in, I believe, Plumas County, and took out several thousand dollars in just an hour or two and that was the end of it.

He was a real sportsman and nothing gave him more of a thrill than to follow a buck deer in the snow . . . trout fishing, he'd just wade right in the water and didn't even try to keep from getting wet. I don't believe he ever owned a pair of waders in his life. His brother told me he would get up in the middle of the night and put his clothes on to follow the baying of a couple of foxhounds . . . and my brother, who hunted and worked and fished with him said he'd walk 20 mi in August just to hear the bugling of a bull elk.

He was, as the late Frank King always said, "a good fellow to take on a trip."

I'm just back from my annual deer hunting trip to "Old Wyoming" and brought back a buck deer and a buck antelope, and me with seventy-four years behind me! (At one point) we drove into a bunch of antelope . . . scattered along the North Platte River for two miles or thereabouts. I asked two of my nephews, who are cow men, how many there were . . . "Oh, between three and four hundred." I did not have any idea there was anything like it left in the world.

Atha Albert Richie
Rialto, Calif.

Rhenium via $(NH_4)_2SO_4$

Sir:

Clyde Hall and I have been working (for some time) on a rich complex ore of tungsten, molybdenum, gallium and germanium. We discovered considerable material (answering tests for rhenium) but were unable to obtain spectrographical confirmation. On July 20, 1954, we took a sample of high grade potassium-phrrhenate powder for spectrographic examination.

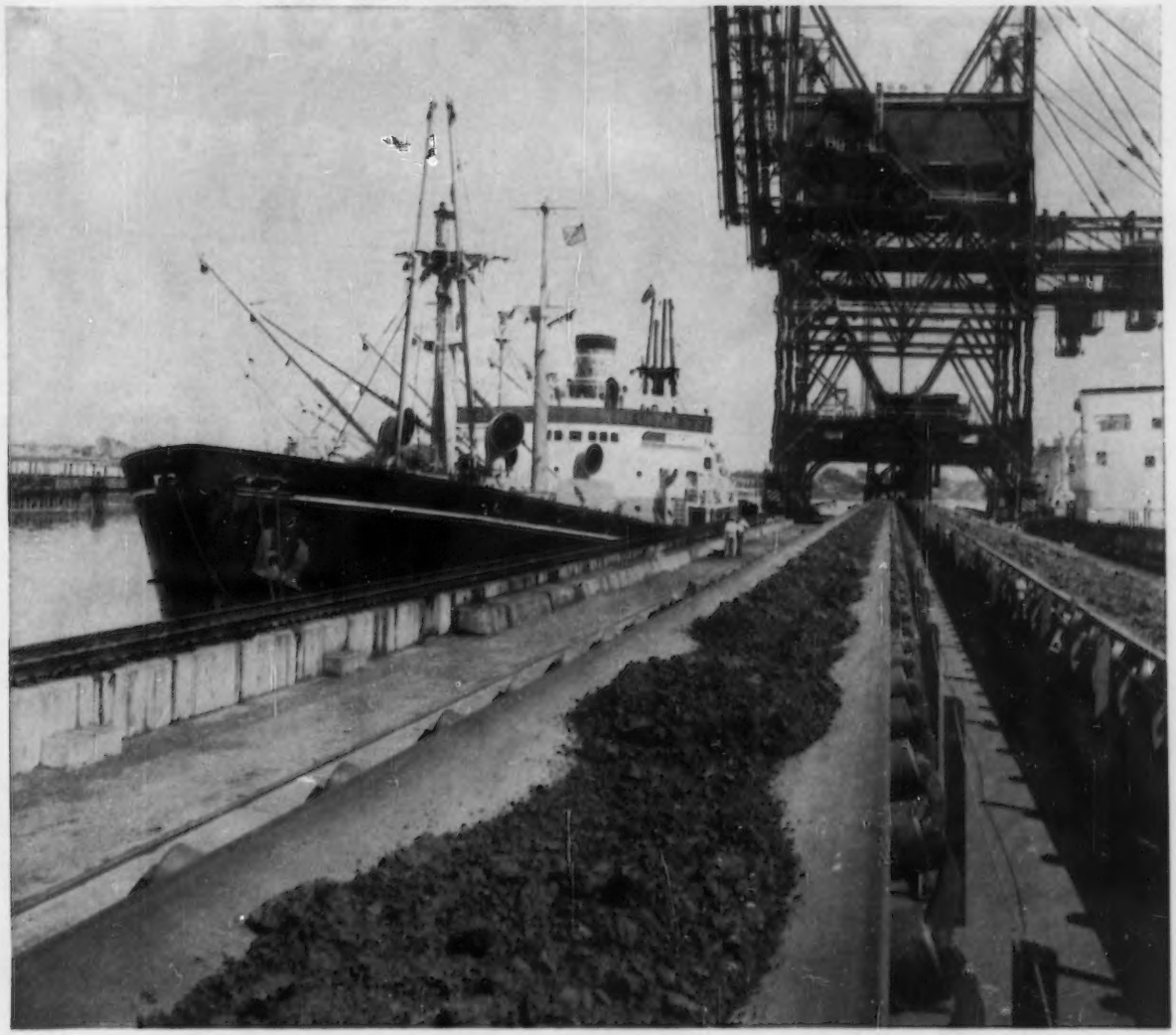
The operator told us that he was unable to read rhenium in the oxide form and his analysis No. 387360 reported

"potassium	Major constituent.
	Minor constituents:
rhenium	None found"

Upon receipt of this report we set about to discover a method of reducing the rhenium to metal in the Spectrol Arc so that it would show up on the film and came to the conclusion that if a strong reducing agent were added that the rheni-

(Continued on p 110)

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



Saving $200 an hour

A typical example of B. F. Goodrich improvement in rubber

THAT'S what it would cost, $200 an hour, to keep that ocean-going freighter tied up at dock. Three thousand tons of iron ore from foreign ports are dumped onto that moving rubber belt every hour. Ship-to-shore unloading dock takes a belt half a mile long. It has to lift those 3000 tons 80 feet up into the air.

Engineers knew that ordinary belts, of rubber-covered cotton fabric, could never stand the strain of lifting such heavy loads so high. Stop to repair a belt, and the $200-an-hour waste would go on.

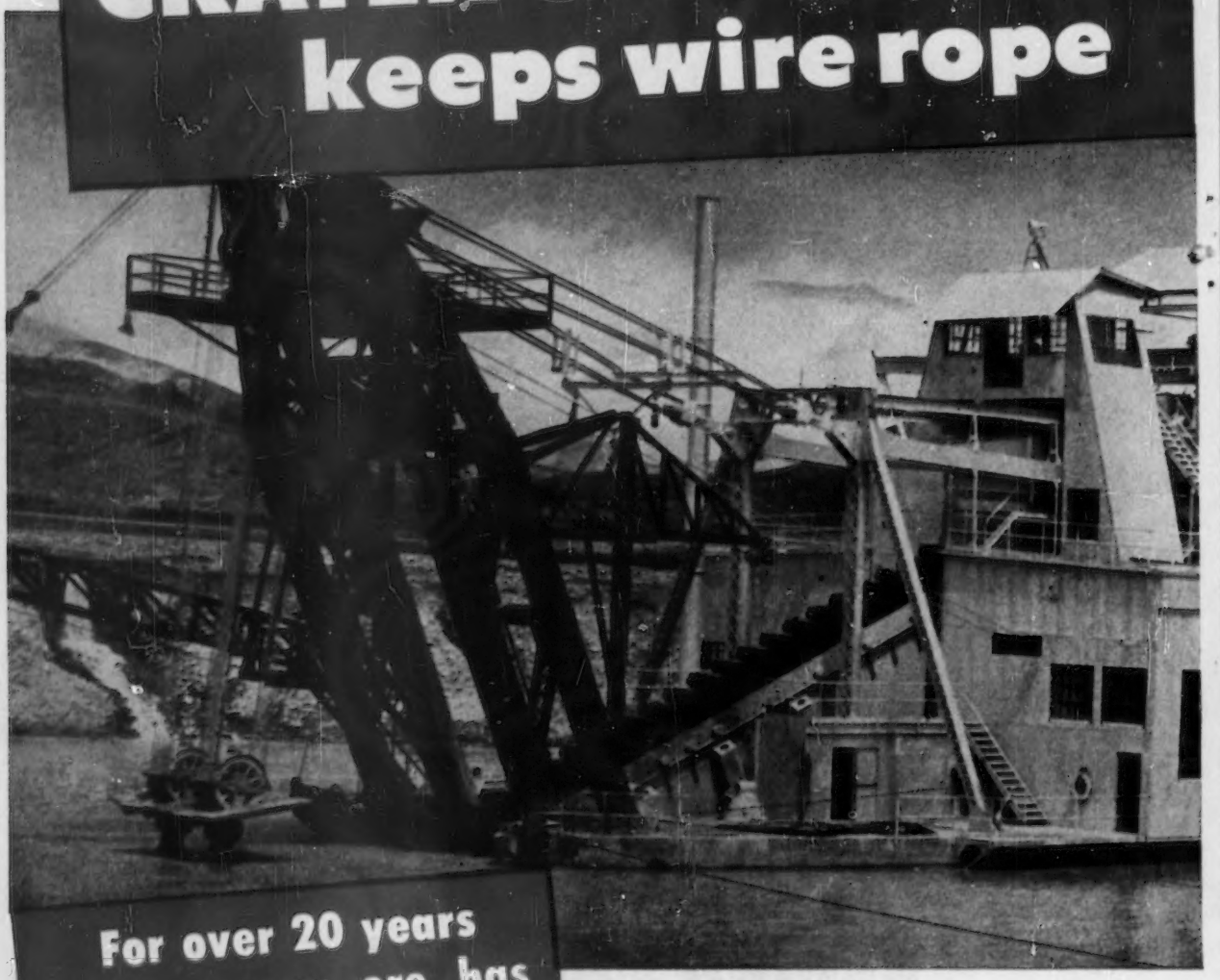
B. F. Goodrich engineers went to work on the problem and developed the belt in the picture—*steel cords* instead of cotton fabric. Rubber for flexibility, for carrying, and for resisting wear; steel for strength. This belt can unload a ship in a few hours, without the danger of breakdown.

Today, this improved belt is at work in dozens of other places, too, where the load is heavy, the climb is steep. In fact, the first steel cord belt B. F. Goodrich ever made is still going strong after 6 years and 9 million tons of iron ore.

B. F. Goodrich has a never-ending program of improvement which results in such products that stand harder use, last longer, and so cost far less in terms of useful life. Don't be too sure the service you are getting from belting, hose, tank linings or any rubber product is all you can expect until you learn what B. F. Goodrich has done recently to improve the products you use. Call in your B. F. Goodrich distributor or write *The B. F. Goodrich Co., Dept. M-348, Akron 18, Ohio.*

B.F. Goodrich
INDUSTRIAL PRODUCTS DIVISION

CRATER'S GREATER keeps wire rope



For over 20 years more copper ore has been mined in the U.S. with Texaco-Lubricated equipment than with any other

EVEN WHEN wire rope works in water, *Texaco Crater* will protect it against wear and rust, keep it strong longer. Each strand gets a long-lasting, protective coating of lubricant which also surrounds and preserves the hemp core. With *Texaco Crater*, rope life goes up, maintenance costs come down.

On open gears, *Texaco Crater's* stick-to-it-iveness

TUNE IN...TEXACO STAR THEATER starring DONALD O'CONNOR or JIMMY DURANTE on TV Saturday nights. METROPOLITAN OPERA radio broadcasts Saturday afternoons.

TEXACO

TEXACO

PROTECTION strong longer

affords longer lasting protection against load shocks and wear. Gears run more quietly, last longer, cost less for maintenance.

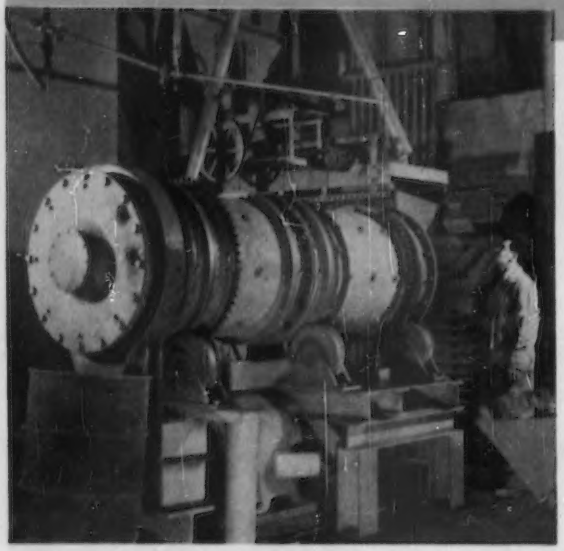
For both applications, there's added convenience in using *Texaco Crater X Fluid.* It goes on as a liquid, stays on as a persistent, protective film just like regular *Texaco Crater.*

In mine car wheel bearings of all types, the lubricant to use is *Texaco Olympian Grease.* It assures easier starts in cold weather, gives longer lasting protection.

Let a Texaco Lubrication Engineer give you all the facts. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

Lubricants and Fuels
FOR THE MINING INDUSTRY

Here's How Industry's Top



Precision tests in the Allis-Chalmers research laboratory determine grinding characteristics and power requirements—accurately predict full-scale performance.

helped increase smelting capacity at the BUNKER HILL & SULLIVAN MINING AND CONCENTRATING CO. Kellogg, Idaho

IN lead smelting, Bunker Hill & Sullivan uses a charge for their roasters made up of limestone, reclaimed slag, lead concentrates and circulating by-products. Realizing that a uniform and porous charge would increase roaster capacity and produce an improved sinter, Bunker Hill & Sullivan decided to pelletize the roaster charge. In order to achieve a uniform mixture and control the pellet size, it was necessary that all materials be crushed to minus ¼ inch, with the bulk of the materials minus 10 mesh. The main charge ingredients requiring crushing consisted of limestone, reclaimed slag and return sinter. Allis-Chalmers was asked to help with this problem.

Here's what Allis-Chalmers did:

Lab Tests The Allis-Chalmers lab team went to work on samples of these three materials. Impact and compression tests were made to determine crushing resistance. Grinding characteristics were established in rod mill grindability tests. Slag was found to be the ingredient most resistant to crushing. The tests also helped determine type and size of equipment needed and power requirements. All this vital information was obtained easily and at little cost.

Pilot Plant Run Because an unusually large dry grinding rod mill had been indicated by the lab tests — and to reveal any factors which may have remained hidden in tests on small samples — twenty tons of slag were run in the Allis-Chalmers pilot plant. Evaluation of all test findings by specialized engineers indicated the application of a *Low-Head* screen, *Hydrocone* gyratory crusher and an Allis-Chalmers dry grinding peripheral discharge rod mill for this crushing problem. The equipment is now operating in the Bunker Hill & Sullivan plant where it produces the required finely crushed material for production of pellets.

Help for Your Staff or Consultants The same personal, expert attention is available to you. Your A-C representative, backed by industry's top technical team, is always ready to help you make your operation as efficient and profitable as possible — whether it's a matter of planning a complete plant or merely helping you over an occasional rough spot.

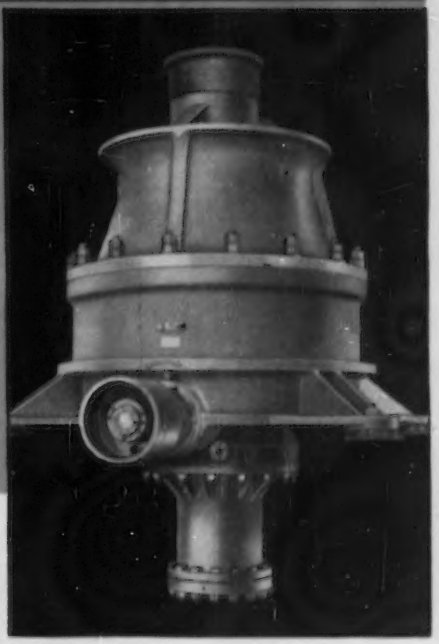
Continuous Service Most important is the fact that Allis-Chalmers interest does not terminate with the installation of equipment. Laboratory facilities, periodic equipment checkup, maintenance, and fast emergency parts service are yours continuously from Allis-Chalmers.

ALLIS-

Technical Team

In the Bunker Hill & Sullivan operation, a 48-in. *Hydrocone* crusher preceded by an Allis-Chalmers rod deck screen produces a minus ¾-in. feed for the 9 x 12 Allis-Chalmers dry grinding peripheral discharge rod mill which delivers a minus 10 mesh product for pelletizing.

Low-Head and *Hydrocone* are Allis-Chalmers trademarks.



A-4402

ALLIS-CHALMERS
Equipment for the Mining and Rock Products Industries

Crushers — all types
Vibrating Screens — all types — Grinding Mills — all types
Kilns — Coolers — Washers — Dryers — Smelting Equipment

CHALMERS

A-C ALLIS-CHALMERS

For complete information, call your nearest A-C district office or write Allis-Chalmers, Milwaukee 1, Wis.

Intake House Plant

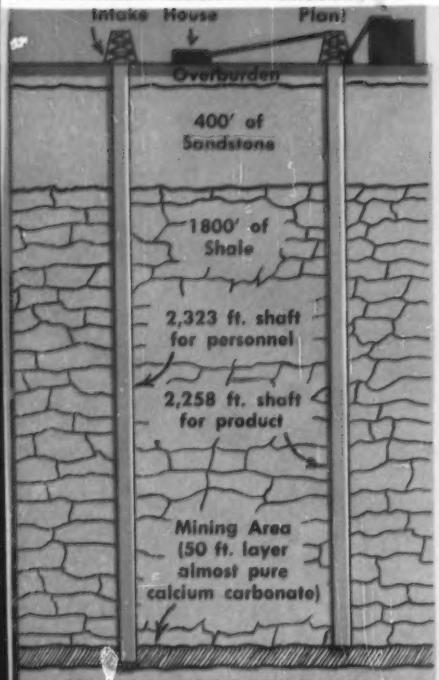
ON January first of this year, Dorr-Oliver Incorporated became a corporate entity through the merger of The Dorr Company, Engineers and Oliver United Filters Incorporated. Not a merger in name only, the combined staffs, engineering skills and facilities of the two organizations are being welded into a single unit, with a vastly increased capacity to serve on a worldwide basis.

Both companies have their roots in gold ore metallurgy. The Dorr Company was founded by John Van Nostrand Dorr on his early inventions, the first of which was developed in 1904 to solve the problem of mechanical classification of gold ores. Oliver United had its beginning in 1907 with the development of the first successful continuous vacuum filter by Edwin Letts Oliver and its practical application to the cyanide process. Since their inception, both companies have grown steadily in technical stature to positions of leadership in their ever-widening and complementary, fields.

This cumulative, combined experience . . . coupled with a progressive faith in the future . . . is the strength of Dorr-Oliver. For present and future clients alike throughout the world it means better solutions to process problems in those fields of metallurgical, chemical, industrial and sanitational engineering in which Dorr and Oliver have specialized for nearly half a century.

DORR-OLIVER
INCORPORATED
STAMFORD, CONNECTICUT, U.S.A.

Edwin Letts Oliver, Founder and President of Oliver United Filters, at left and John Van Nostrand Dorr, Founder and Chairman of the Board of The Dorr Company, at right. The globe, long symbolic of worldwide operations, stands in the home office of the new corporation in Stamford, Connecticut.



300 ft. layer of dolomitic limestone unsuitable for mining because of high content of magnesium

Diagram shows the two 8′ x 17′ shafts. One carries men and equipment, the other brings crushed limestone to the surface. Shafts also carry in 100,000 cubic feet of fresh pumped air every minute. They also take out blasting and diesel fumes. The natural mine air is dry . . . no water drips from ceilings or seeps through walls. Temperature stays 80° year-round. Cave-in dangers are absent . . . strength of the limestone sidewalls, plus arching effect of 2,000 ft. of rock above, eliminates need for shoring or other artificial bracing.

Maneuverability of Rear-Dumps (with 90° turns within a radius of half unit's length), plus power steer, quickly position body under dipper.

2300 ft. underground

7 Rear-Dumps haul million tons of limestone yearly

Keep production "on schedule" at underground limestone mine

Imagine yourself with the problem that faced a large Eastern chemical company a few years ago.

Your plant needs thousands of tons of limestone daily for manufacture into agricultural lime and cement, and for chemical processing into chlorine, soda ash, bleaching compounds, and other products. Much of your stone has to be shipped in. Transportation prices are boosting your costs.

Deep drills find limestone

With these difficulties, you'd undoubtedly do what this company did — look for a nearby source. You'd probably never guess what would turn up. Some 2,300 feet below your own backyard, under clay, shale, and sandstone, your drills would run into a 50 ft. layer of almost pure limestone, formed through the ages by the remains of sea-floor animals which died over 300 million years ago. Satisfactory material, tests showed, for all your needs. But how could you get to it?

This company answered that question by borrowing some ideas from underground ore and coal miners. First, they drove two 8′ x 17′ steel-and-concrete-lined shafts vertically to the limestone bed. Then, they developed a network of underground roads (now totaling 19.9 miles) to a centrally-located crusher. Next they equipped the mine with 4 electric shovels, 9 drilling rigs, a tractor, 4 loaders, 4 trucks, and a bus to move 80 workers to their assignments.

For hauling, they chose 7 LeTourneau-Westinghouse Rear-Dumps, 16-ton models with bodies built up to hold 20 tons on level hauls. These electric-control units, company officials figured, were ideal for underground use because they could turn non-stop anywhere on the narrow 32′ roadways — and their simple rugged construction would reduce repair work.

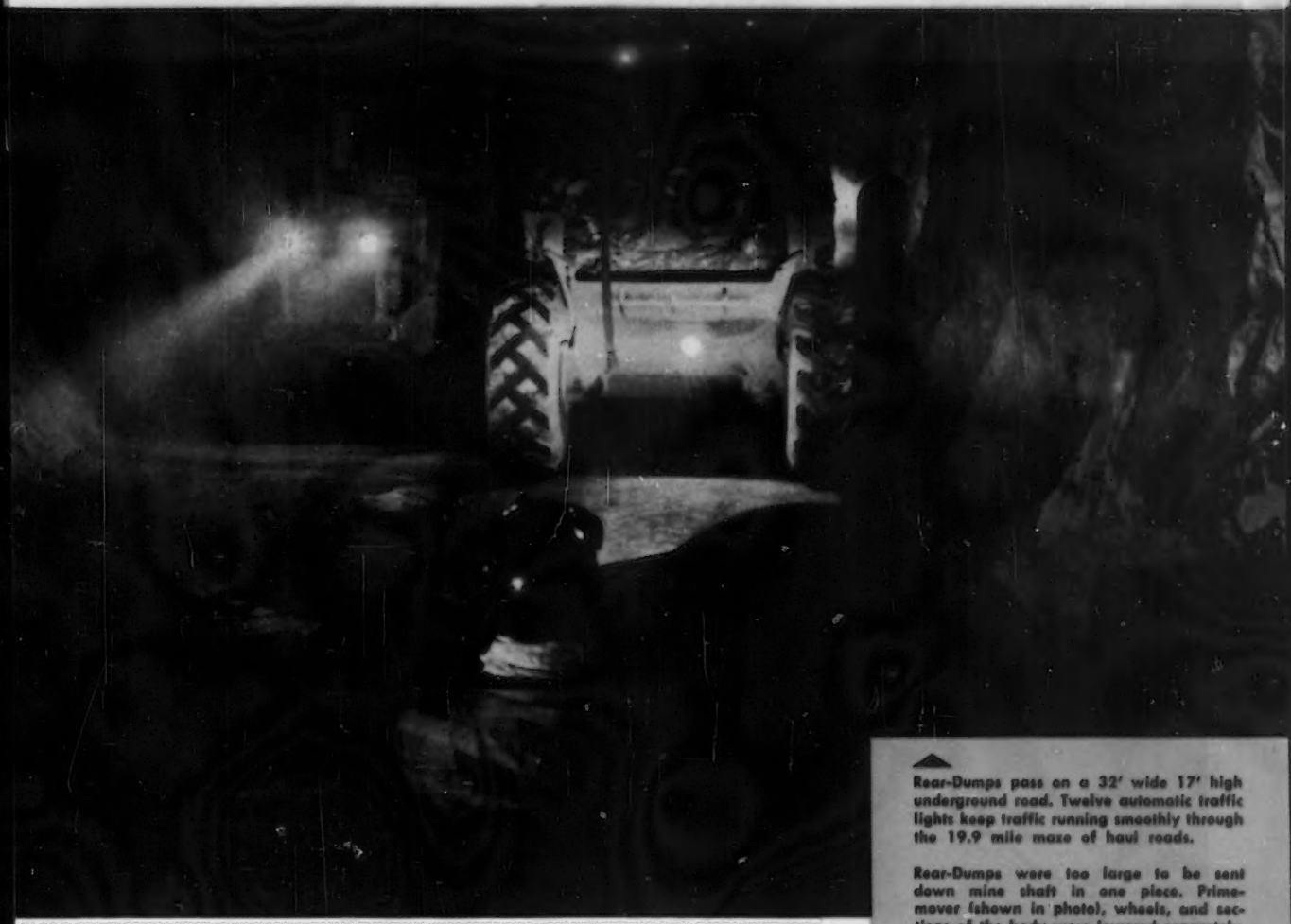
Assemble machines on mine floor

Then came another problem: how to get these big Rear-Dumps into the mine, nearly ½ mile below? LeTourneau-Westinghouse engineers helped out here. The rigs were shipped to the plant tack-welded. Wheels and prime-movers were separated and lowered down the shaft. Truck bodies, too, were cut apart and lowered. Re-welds and

In addition to these Rear-Dumps, Tournapull prime-movers power:

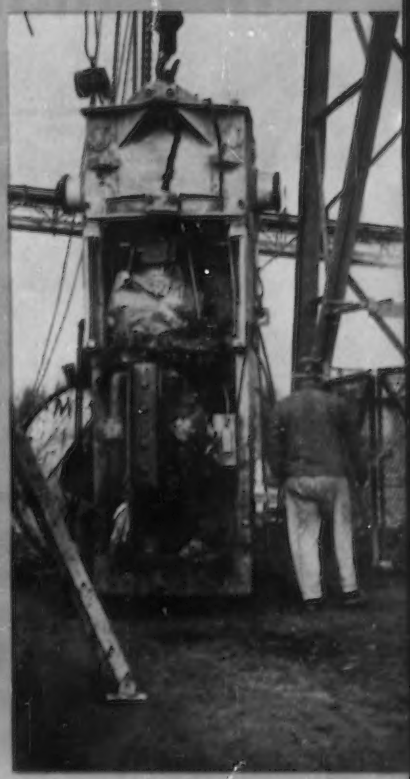
- Scrapers
- Flatbeds
- Bottom-Dumps
- Cranes
- Logging Winches

All electric-control, all interchangeable



Rear-Dumps pass on a 32' wide 17' high underground road. Twelve automatic traffic lights keep traffic running smoothly through the 19.9 mile maze of haul roads.

Rear-Dumps were too large to be sent down mine shaft in one piece. Prime-mover (shown in photo), wheels, and sections of the body were lowered separately. Each 37,500-lb. unit was re-welded and re-assembled in the mine.



re-assembly were made on the mine floor, and work was started.

With the 1½-yd. shovels loading well-blasted limestone, each Rear-Dump gets 20-ton heaped load in about 2 minutes. Haul of 3000 feet one way over the level underground roads is made in second and third gear (7 and 13 mph); return in third. The 7 Rear-Dumps average 3,600 tons of limestone per 16-hour day . . . over a million tons per year. Short turns with power steer have proved a major advantage in speeding spots at shovel, at hopper, for backing to dump into hopper for the 48 x 60 crusher, and for maneuvering in all tight spots.

Another advantage these LeTourneau-Westinghouse Rear-Dumps have given is safety. *Each* of the four wheels has more braking surface than all *four* wheels on most haulers. Operators travel safely and with confidence at high speeds.

Tires last over 7000 hours

A third advantage . . . there has been practically no downtime for tire troubles on the Rear-Dumps' big single pneumatics. In 4 years of single and double-shifting the 7 units, only one blowout has occurred. Sets of tires have lasted as long as 7,000 hours without recapping, despite the rough pit floor and heavy 20-ton loads. Plant records show over-all mechanical efficiency for all the Rear-Dumps of 96%.

You, too, can lick your hauling problems with high-speed rubber-tired LeTourneau-Westinghouse Rear-Dumps. Ask for a demonstration on your job. There's a size to fit your needs . . . 9, 18, 35, and 50 tons.

R-664-Q

LeTourneau-Westinghouse Company

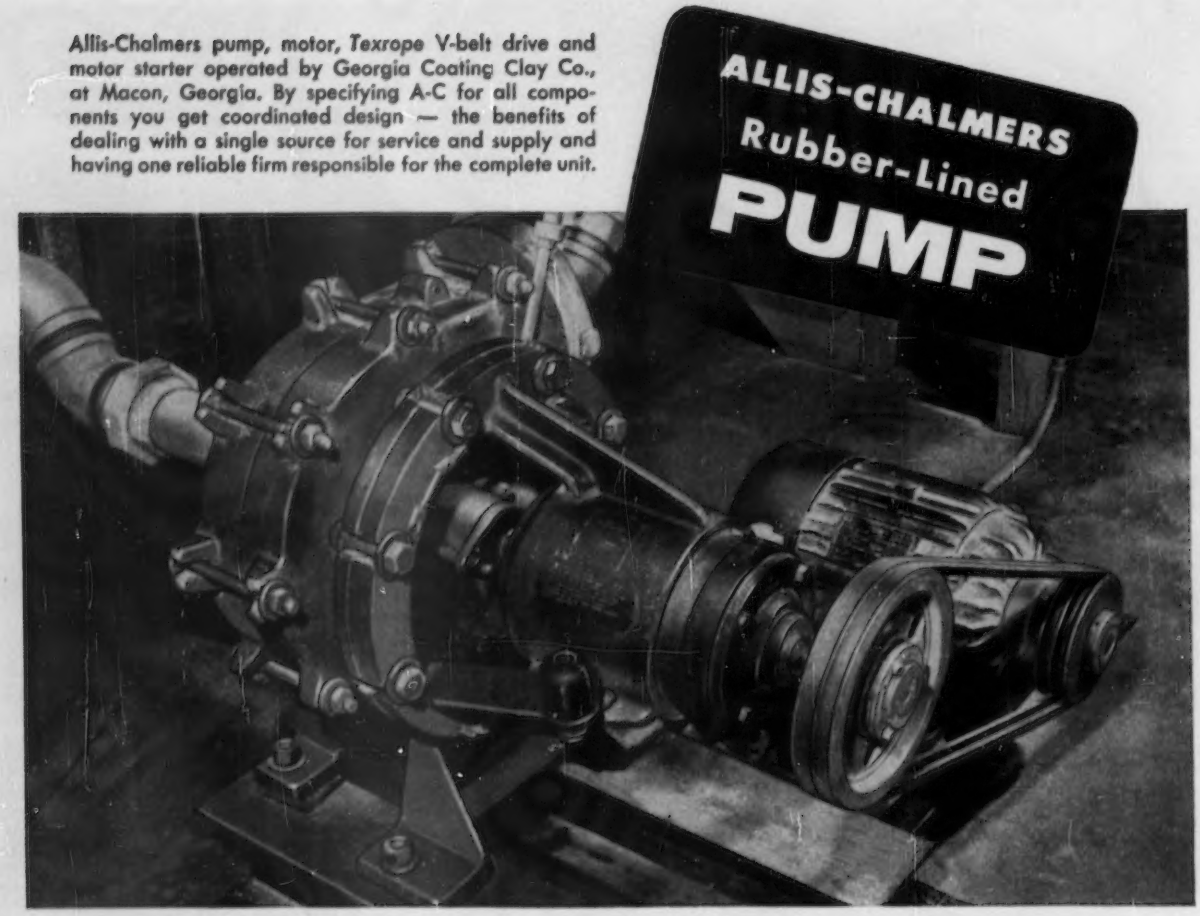
PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

THIS KIND OF SHOVEL SERVICE

• Logging Winches
All electric-control, all interchangeable

Allis-Chalmers pump, motor, *Texrope* V-belt drive and motor starter operated by Georgia Coating Clay Co., at Macon, Georgia. By specifying A-C for all components you get coordinated design — the benefits of dealing with a single source for service and supply and having one reliable firm responsible for the complete unit.



In 7 months' continuous duty...
NO MAINTENANCE

Georgia Coating Clay Co. uses A-C Rubber-Lined Pump to move highly abrasive clay slurry

SINCE ITS INSTALLATION IN MARCH, 1954, this Allis-Chalmers Rubber-Lined Pump has been operating "round the clock," handling 17% to 36% clay slurry with pH ranging from 5.0 to 7.0. The previous pump required impeller replacement about every six weeks.

Long Life, Lasting High Efficiency

With Allis-Chalmers Rubber-Lined Pumps you can make adjustment to maintain proper clearances between the impeller and the casing. This adjustment — which prolongs pump life and efficiency — is merely a matter of resetting adjusting screws. Owners report A-C Rubber-Lined Pumps last from 10 to 50 times as long as hard alloy pumps.

GET ALL THE FACTS...

Find out how these new pumps help you maintain high output, cut maintenance, service and down-time costs. See your representative or write Allis-Chalmers, Milwaukee 1, Wis. Ask for Bulletin 52B8156. A-4543

Texrope is an Allis-Chalmers trademark.

ALLIS-CHALMERS

A Subsidiary of Westinghouse Air Brake Company

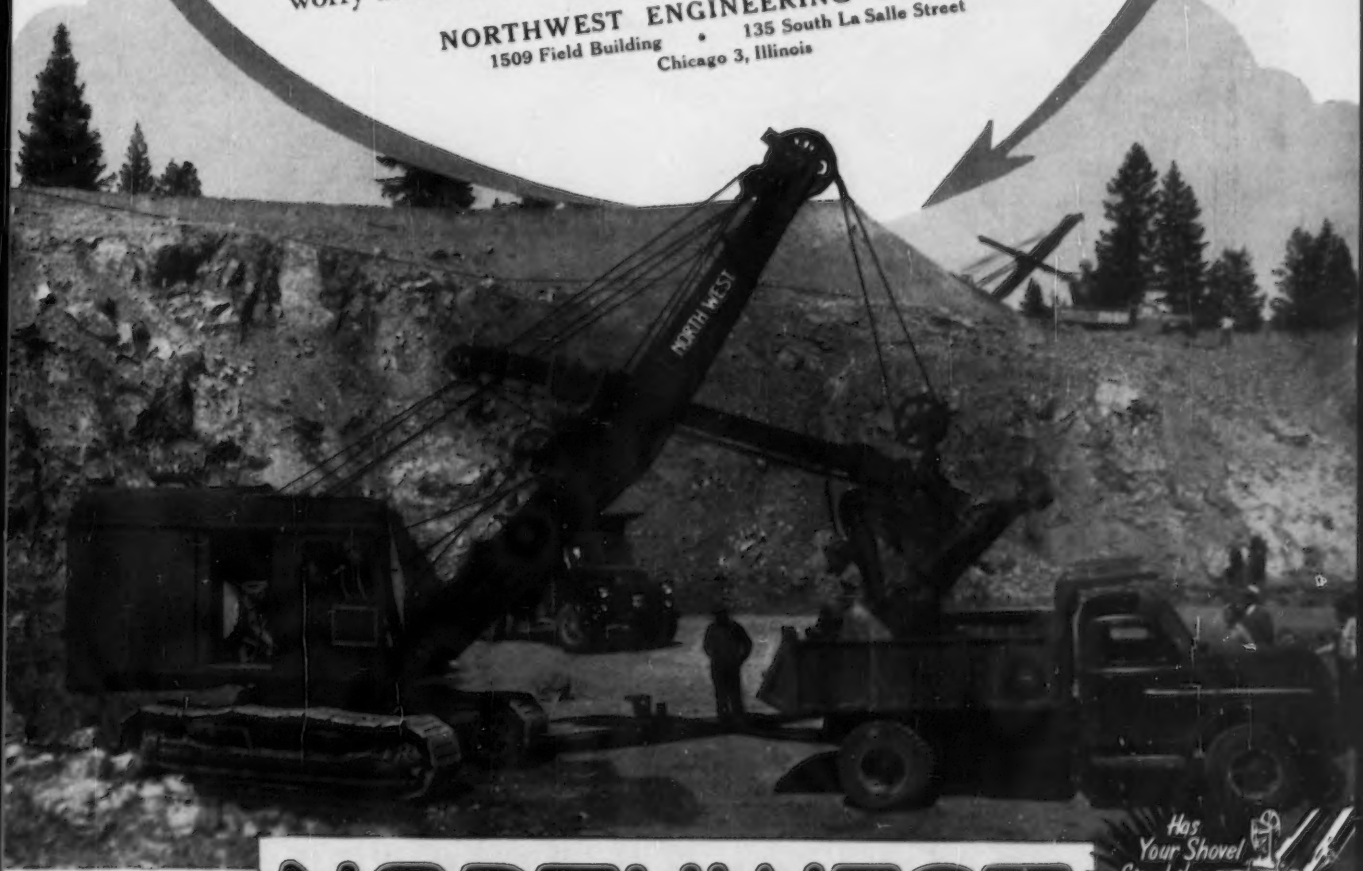
THIS KIND OF SHOVEL SERVICE MAKES MONEY!

A year ago we told you about Northwests at Granby Consolidated Mining, Smelting and Power Company, Ltd. of Copper Mountain, B. C., Canada. That machine has now been in service a year. In that time it has handled nearly half a million tons of material including 241,370 tons of ore.

The Northwest worked 8 hours a day, 316 days, with only 3 hours down time in the whole period. You figure it out—or shall we tell you—that's an average of 1,539 tons a day and that's output!

This is typical of Northwest equipment. It tells the story of why so many Northwests both large and small, are in the quarries, the mines, the pits or on the pioneering part of jobs everywhere. They are *real* Rock Shovels and when you have a real Rock Shovel you never have to worry about output in any kind of digging.

NORTHWEST ENGINEERING COMPANY
1509 Field Building • 135 South La Salle Street
Chicago 3, Illinois



NORTHWEST

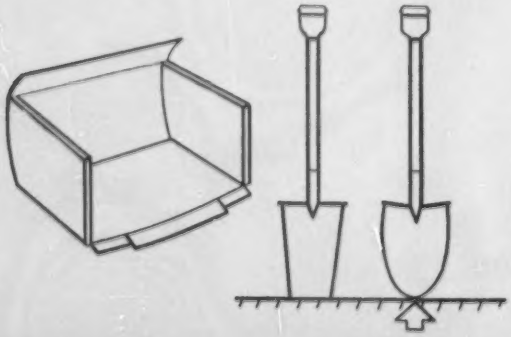
Convertible for any Mining Material Handling or Excavation Problem

Has Your Shovel Stood the ROCK TEST

Compare these dirt-

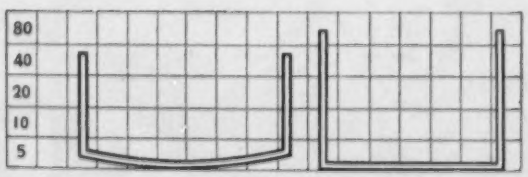
PENETRATES FASTER

Curved and offset cutting edge on Allis-Chalmers Motor Scrapers concentrates all the horsepower on the center section during initial penetration. The penetrating ability of a round-end spade helps illustrate the practical soundness of this Allis-Chalmers design.



LOADS FASTER

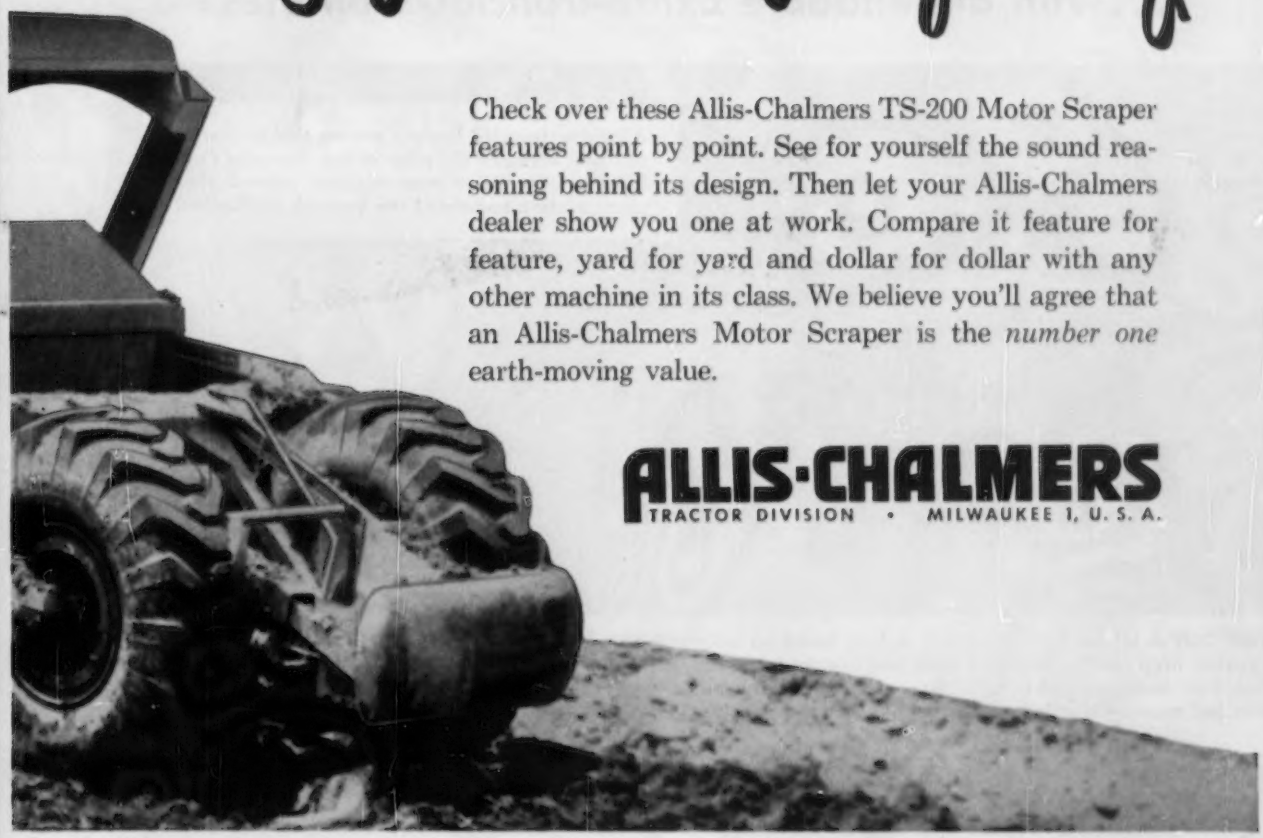
Low, wide bowl plays an extremely important part in ease of loading. Tests have proved that loading resistance is largely determined by the height to which the load is built. New dirt entering the bowl must lift the load directly above it in order to make room for itself.



This chart shows how loading resistance continually increases as the load builds up . . . how the lower, wider bowl of an Allis-Chalmers Motor Scraper requires less time and power to get the same yardage.

PERFORMANCE MAKES DOLLARS

moving features before you buy

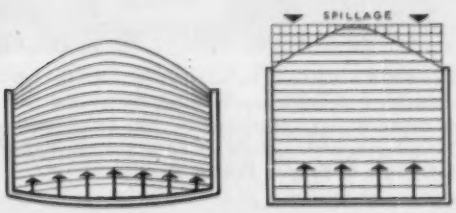


Check over these Allis-Chalmers TS-200 Motor Scraper features point by point. See for yourself the sound reasoning behind its design. Then let your Allis-Chalmers dealer show you one at work. Compare it feature for feature, yard for yard and dollar for dollar with any other machine in its class. We believe you'll agree that an Allis-Chalmers Motor Scraper is the *number one* earth-moving value.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

HEAPS AUTOMATICALLY

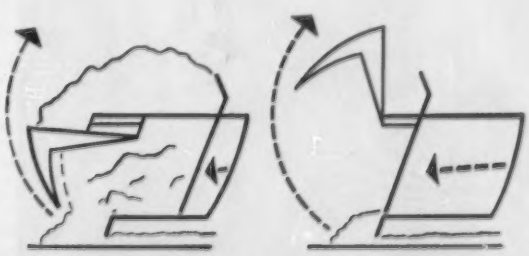
The combination of slightly deeper center cut and correctly angled cutting edge shapes the load as the scraper fills. The greater volume of dirt flowing into the center of the bowl "boils" forward, to the rear and to the sides, producing an automatically heaped load without excessive spillage.



These diagrams show how an automatically heaped load avoids costly spillage even though the center is built up above the sides of the bowl.

SPREADS EVENLY

Forward movement of ejector is timed with lifting action of apron, which provides a continuous flow of material to insure a smooth, even spread.



High apron lift prevents any possibility of material's jamming. Even when loaded from overhead, anything that can be put into the bowl can be easily ejected.

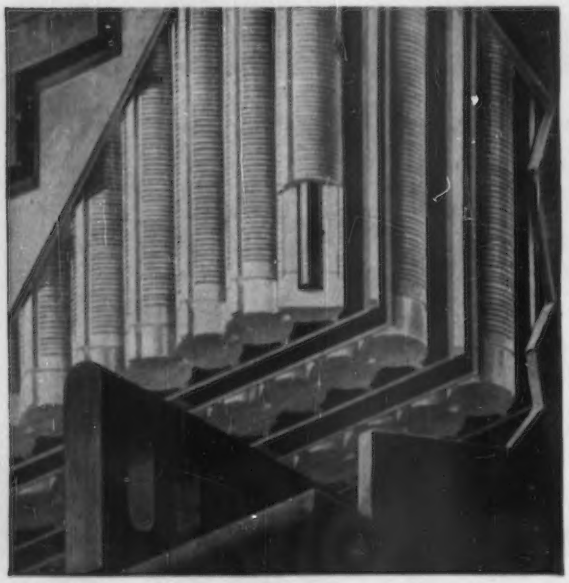
WHEN DESIGN MAKES SENSE

GET LOWER PRODUCTION COSTS, FASTER HAULAGE

...with dependable Exide-Ironclad batteries!

An Exide-Ironclad battery powers this tractor in the new Freeman #4 mine of the Freeman Coal Mining Corporation near Marion, Illinois. Efficient, modern methods have boosted production.

YOU CAN count on Exide-Ironclads to help speed up car changes, keep loaders busy and main line haulage moving fast. This means you get more trips per shift, more production per man-hour with less cost per ton handled. Exide powered equipment will handle as much tonnage during the last hour of the shift as during the first. Lower costs for operation, maintenance and depreciation make Exide-Ironclad batteries your best power buy—AT ANY PRICE!



THE POSITIVE PLATES are the heart of any battery. Only Exide uses a slotted tube construction. By use of tubes, more active material is exposed to the electrolyte, providing *greater power*. Also, more active material is retained, giving *longer working life*.

THE NEW THRIFTY HAULER! The improved shuttle car battery using *Non-oxidizing* plastic power tubes for longest battery life, more capacity in the same space. For full details, call your Exide sales engineer—write for Form 1982 (Installation and Maintenance of Motive Power).

Your best power buy ...AT ANY PRICE!

Exide® IRONCLAD® BATTERIES

Exide INDUSTRIAL DIVISION, The Electric Storage Battery Company, Philadelphia 2, Pa.

The 60-million-dollar port for jet bombers, now building at Portsmouth, N.H., calls for 4,710,000 yards of excavation, 3,000,000 yards of common fill, 750,000 yards of stripping, 431,000 yards of sand fill and 220,000 yards of borrow. Despite freakish distribution of sand and clay deposits, a huge city water well almost dead center of the field—and the heaviest rainfall in years—closely co-ordinated teamwork (as shown above) keeps this job rolling 20% ahead of schedule!

Goodyear tires help keep jobs rolling with the strongest, most durable tire cord ever produced—

3-T NYLON

Made only by Goodyear's *patented* process, 3-T NYLON can take terrific punishment. Users say bruise-breaks are practically unknown, tire growth is controlled. 3-T NYLON is also so *heat-resistant* that users say separation, flex failures and heat blowouts are almost things of the past! Equally important, 3-T NYLON *retains* these qualities—makes Goodyear tires the safest, most lasting on the toughest jobs—cuts total costs with many more relugs or recaps. Better check into 3-T NYLON before buying or specifying any new tire. Goodyear, Truck Tire Dept., Akron 16, Ohio.

Get them in
3-T NYLON
for longest life ever!

FOR EACH JOB, THERE'S A COST-CUTTING GOODYEAR TIRE!

GOODYEAR

MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND

Road Lug, All-Weather, Sure-Grip—T.M.'s
The Goodyear Tire & Rubber Company, Akron, Ohio

Western's dare...You compare!

Check carefully these vital requirements for modern dump car performance before you buy!

COMPARE	WESTERN	MAKE "B"	MAKE "C"	
1. Simple, rugged, enclosed, protected, foolproof door mechanism located at ends of car—(not underneath body).	YES	NO	NO	
2. Car body supported directly upon sturdy draft beam and not on trunnions.	YES	NO	NO	
3. Dual side pivots or trunnions so located to permit dumping of body with least effort and air consumption.	YES	NO	NO	
4. Large capacity air storage reservoirs for minimum time in dumping.	YES	NO	YES	
5. Operator stands in safe position at end of car to dump car. Operating lever protected by end sill.	YES	YES	NO	
Total	100%	20%	20%	

The world's leading mining companies and railroads have been making such comparisons for years...

that's why Westerns are the world's largest selling dump cars!

You, too, can save a great deal more by investing just a little more in Western cars. They'll cut your operating costs, end high maintenance expense on obsolete cars and give long, trouble-free service.

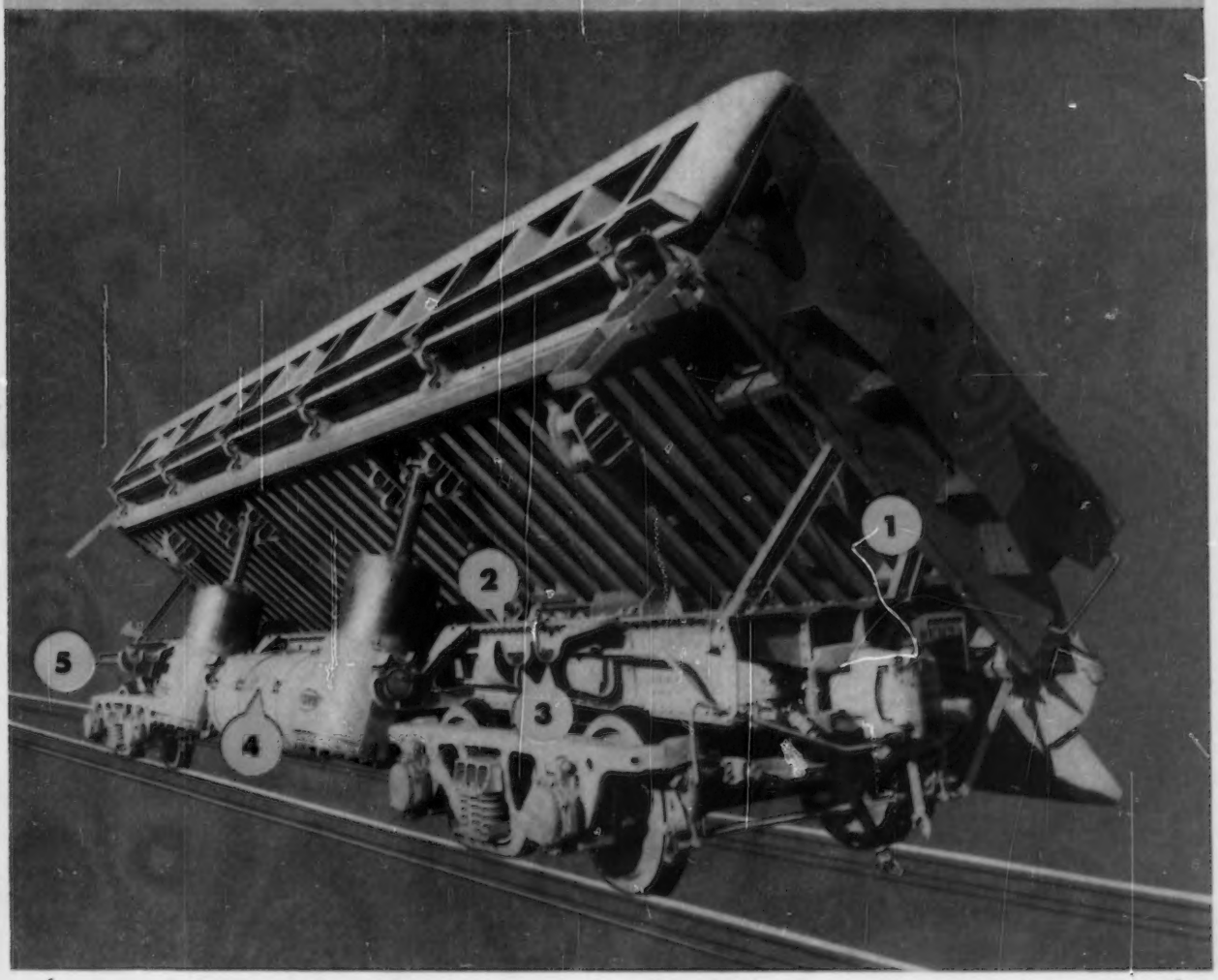
Before you specify . . . *Compare* . . . and you'll buy Westerns!

Write! For complete technical information on Western dump cars (30 to 50 cu. yd.) please address Dept. 6528, Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.

BALDWIN BLH LIMA-HAMILTON

BALDWIN-LIMA-HAMILTON

Philadelphia 42, Pa. . Offices in Principal Cities



"The right wire rope? That's EASY every time!"

IT'S A CINCH to pick the right wire rope for top performance in mining . . . and it pays off! Roebling's new catalog has a section devoted to rope for the mining field . . . shows at a glance the best rope for each purpose and gives you a simple, unique code number ordering system which for the first time in wire rope history *positively* identifies the desired rope.

Write for your copy of the new "Roebling Wire Rope Recommendations and Catalog." And remember that the Roebling Field Man at your nearest Roebling office or distributor is always available to help find the answer to special wire rope problems.

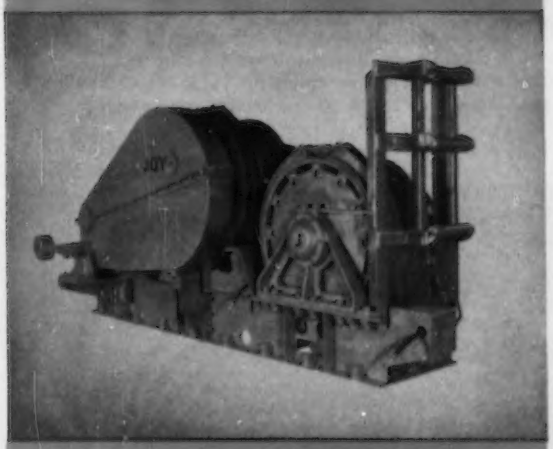
ROEBLING CFI

Subsidiary of The Colorado Fuel and Iron Corporation

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J.

BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 2253 FREDONIA AVE. • CLEVELAND, 13229 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, TRENTON 2, N. J.

5HP—The S-211, the Mighty Mite of the Joy Slusher Family.



150 HP—For rugged, heavy-duty operation, you'll never beat the giant Joy XT-221 Slusher.

The JOY Complete Family of Slushers

From the Mighty Mite . . . the S-211 . . . to the giant XT-221 is a big jump but there are many, many rugged, efficient sizes of Joy Slushers in between that bridge the gap smoothly, completely. You're sure to find one sized exactly right for your job. Here's a representative list:

5 HP—S-211
7½ or 10 HP—FF-211 and FF-311
15 to 25 HP—A2F-211 and A2F-311
20 to 40 HP—B2F-211 and B2F-311
30 to 75 HP—C2F-211 and C2F-311
100 and 125 HP—R-221, RF-211 and RF-212
150 HP—XT-221 and XT-222

All of the more than 300 types and sizes of Joy Slushers have these features which assure low maintenance and operating costs: Large drum diameters for longer rope life; easily removable clutch bands; simple, rugged construction; special water-proof, dirt-proof bearings; and rugged steel frames.

Remember, there is not a scraping job anywhere that can't be efficiently handled with a Joy Slusher. Consult a Joy Engineer for the size and type best for your scraping job. ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario*

Consult a Joy Engineer

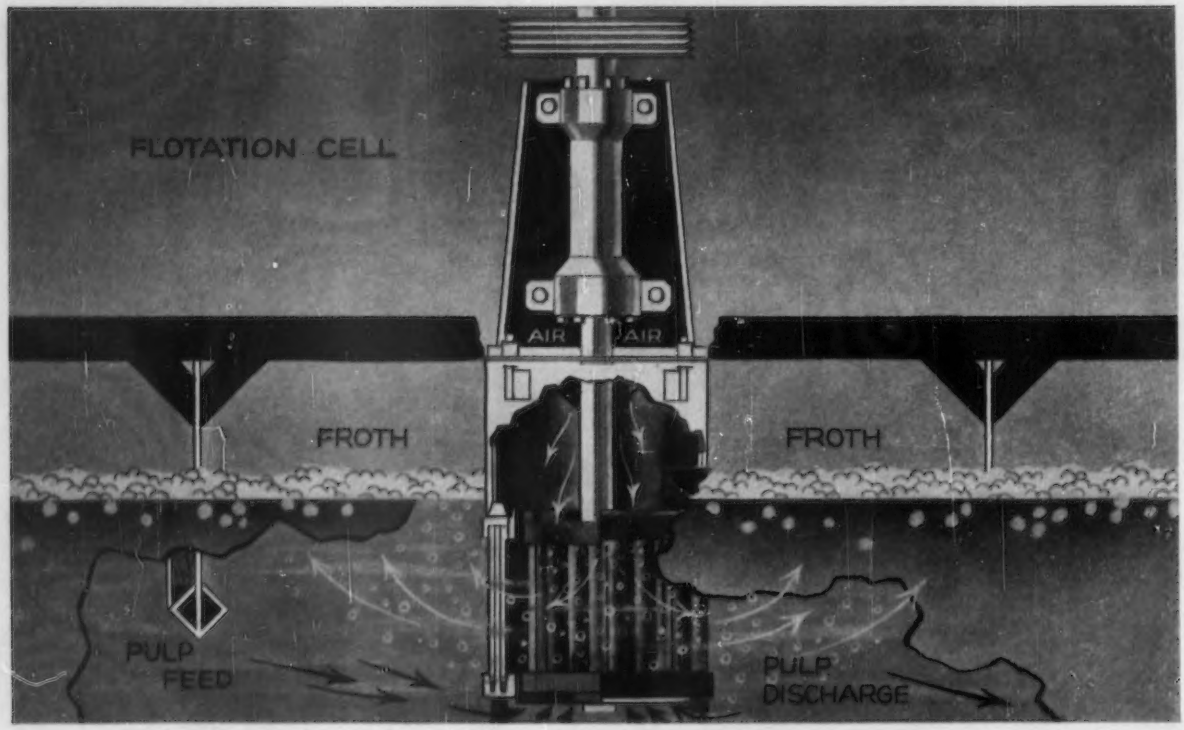
for AIR COMPRESSORS, ROCK DRILLS, HOISTS AND SLUSHERS

JOY

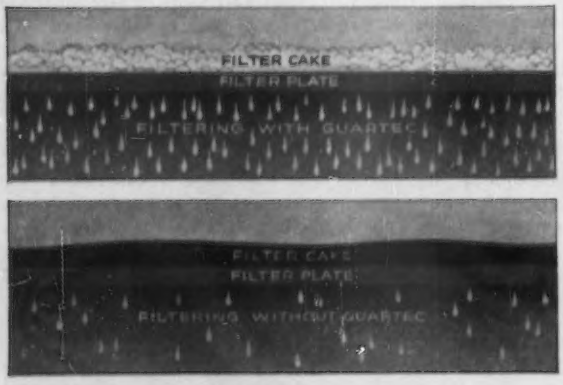
WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING EQUIPMENT

W&D M 5467

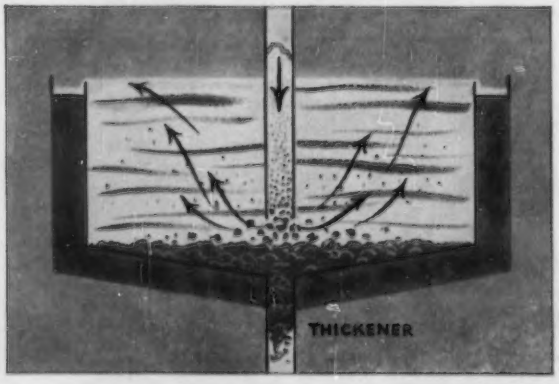
NOW...General



Blinding Gangue Materials to save on expensive collecting agents is an easy matter for Guartec. The long molecular structure of Guartec is just right to blind particles of clay. Usually just a trace of Guartec, as little as 0.15 to 0.25 pounds (4 to 8 cents) per ton of ore, effectively blinds the clay—enabling fast, efficient separation with less collecting agent. With the quick dispersion of Guartec, you can keep an effective concentration in the flotation cells at a rapid rate of pulp flow.



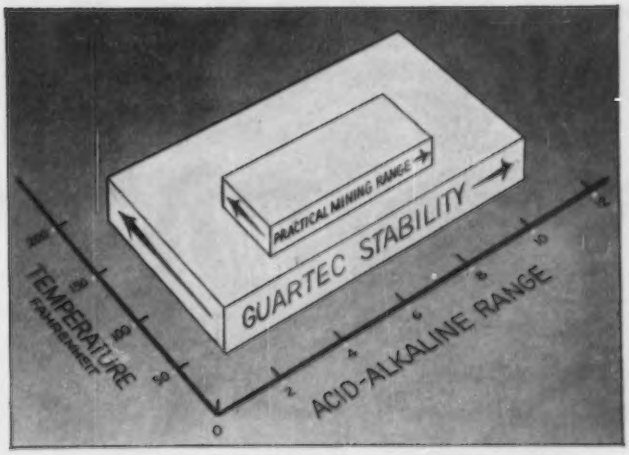
Faster, drier filter cakes are possible when you use Guartec as a flocculant for filtering ore concentrate. Guartec quickly agglomerates filter plugging fine flocs into larger masses that can be filtered quickly and easily with less "down" time and more porous filter cakes.



To speed settling in either thickener or tailings pond, try as little as 0.1 pound of Guartec (roughly 3 cents) per 1,000 gallons of slime. It speeds settling many times over. Thus you can increase production without added investment in equipment. Guartec's flocculating speed also helps you clarify water for either re-use or disposal.

Mills Offers You a New Colloid

GUARTEC—Proved for Faster Filtering, Better Blinding; Has 5 to 8 Times the Settling Action of Starch



Guartec is stable over a wide range of practical mining temperatures and acid or alkaline solutions as shown on the chart illustrated above. Guartec operates effectively over a pH range of from approximately 1.2 to 11, and does not break down into component sugars under extreme temperature changes. It is now being used in the flocculation of pulps at temperatures as low as 40° F. and as high as 180° F.

For mineral processors with filtering, settling, or flotation problems, General Mills now offers Guartec, a natural vegetable gum colloid of the guar seed.

Guartec blinds or flocculates solids. It saves expensive collecting agents, and agglomerates ore particles for fast filtering or settling. With Guartec, water can be clarified quickly for reuse or disposal.

Guartec, with 5 to 8 times the thickening power of starch, is very effective in small concentrations. It is available to you now at as low as 30¢ a pound in 100 pound, moisture-protecting bags. You can get Guartec in two grades. The regular grade is a granular type, while Guartec F is a fine-powder type.

To assure you of constant quality and uniformity, General Mills maintains a modern laboratory right at its plant—the only guar plant located in the guar-growing area of this country. So investigate Guartec in your own mining operations. Do it now.

Suspended slimes in ponds, lakes and streams can be detrimental to good will when you operate near well-traveled waterways. Just a trace of Guartec added to slimes helps settle wastes much faster, avoids pollution controversies over suspended matter.

A moisture-proof lining of pliofilm protects Guartec from rain, snow and other contaminants. This liner also helps Guartec flow smoother from the bag. As a result, Guartec is as free-flowing when it goes into your equipment as when it left the General Mills plant, with moisture content well below the critical point.

For Sample or Technical Information, Write To:

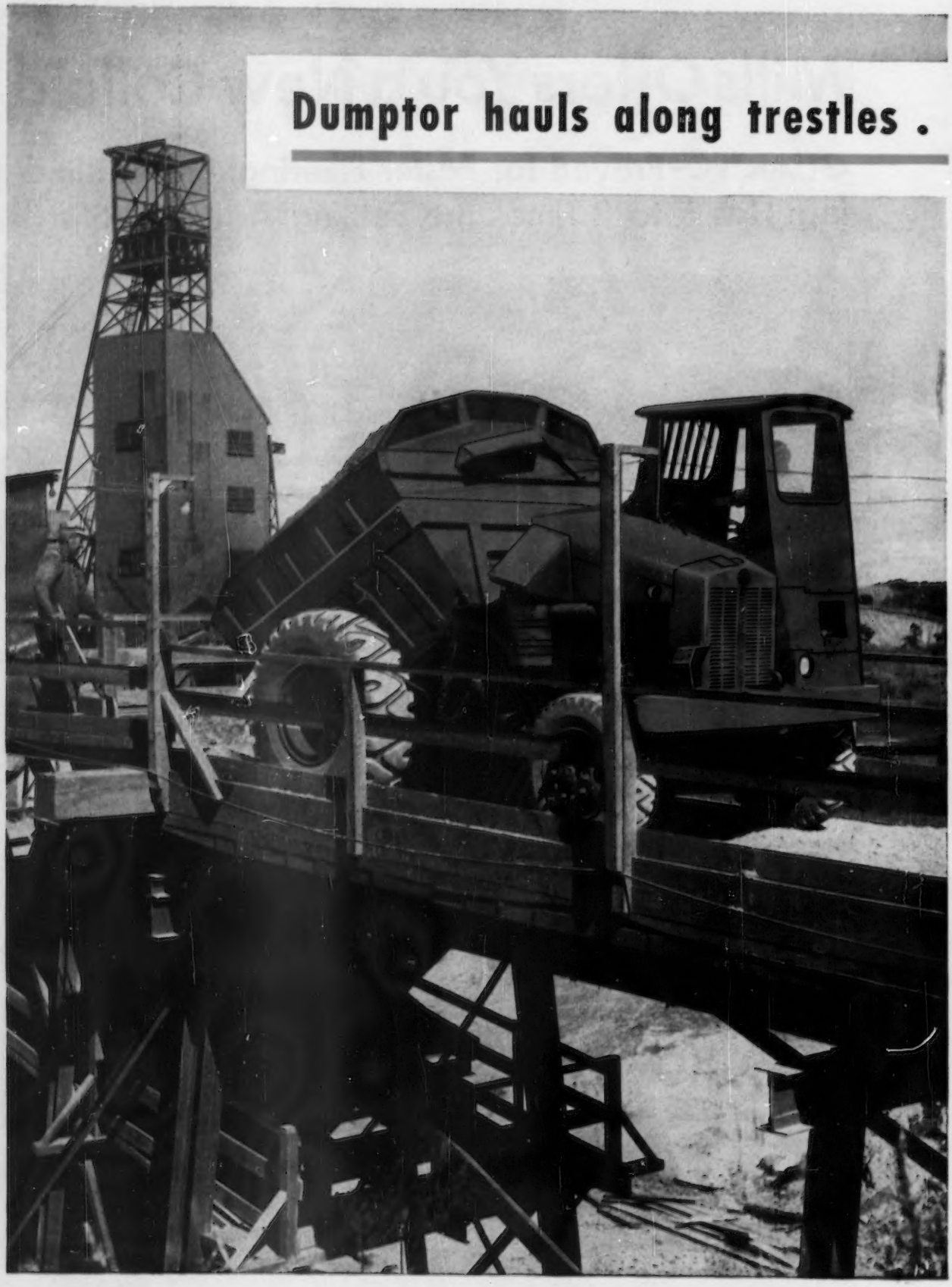
General Mills

Special Commodities Division

400 Second Avenue South

Minneapolis 1, Minnesota

Dumptor hauls along trestles .



. . or tunnels

without turning

Shuttling back and forth between the loading unit and dump area, Koehring Dumptor travels round-trip without turning. It operates with equal ease in both directions on overhead trestles, in confined underground mines, on open-pit ledges and narrow haul roads. Dumptor gets this unique no-turn advantage through a constant-mesh transmission that gives the same 3-speed travel in either direction.

Every turn eliminated cuts 15 seconds off cycle time. This adds up to a substantial increase in yards hauled per hour. For example, by saving only 2 turns, time studies prove that Dumptor increases hourly yardage output more than 10% on an average 1,000-foot haul.

One-second gravity-dumping also maintains a high rate of production. To dump, operator trips body-release lever, and the 6-yard body instantly tilts 70°. One second later the load is out, and Dumptor is on its way back for the next load. There's no 15 to 25-second wait for slow-acting hydraulic or electric body hoists. What's more, gravity-dump never balks, never wears out.

To learn what these Dumptor advantages can mean in increased production and lower hauling costs on your work, call your Koehring distributor, or write for Dumptor® catalog.

KOEHRING COMPANY

Milwaukee 16, Wisconsin

Subsidiaries: PARSONS • KWIK-MIX • JOHNSON K440

On trackless mining operation, Koehring 6-yard Dumptor goes underground . . . shuttles in and out of access tunnel without turning. This heavy-duty hauler has over 6 h.p. per ton of loaded weight, climbs 24% ramps, grades.

Dumptor puts stockpiling on a fast, shuttle-haul basis. It drives up to edge of pile, body forward . . . dumps, and heads back for next load without turning. Instant gravity-dump action kicks the load out over edge of the bank . . . saves a lot of dozer clean-up on the stockpile.

Big square body opening permits loading over either end or sides. Dumptor above is teamed with Koehring 1½-yard 605 shovel . . . a big-production combination. Other Koehring excavators: ½ to 2½ yards . . . cranes up to 79½ tons.

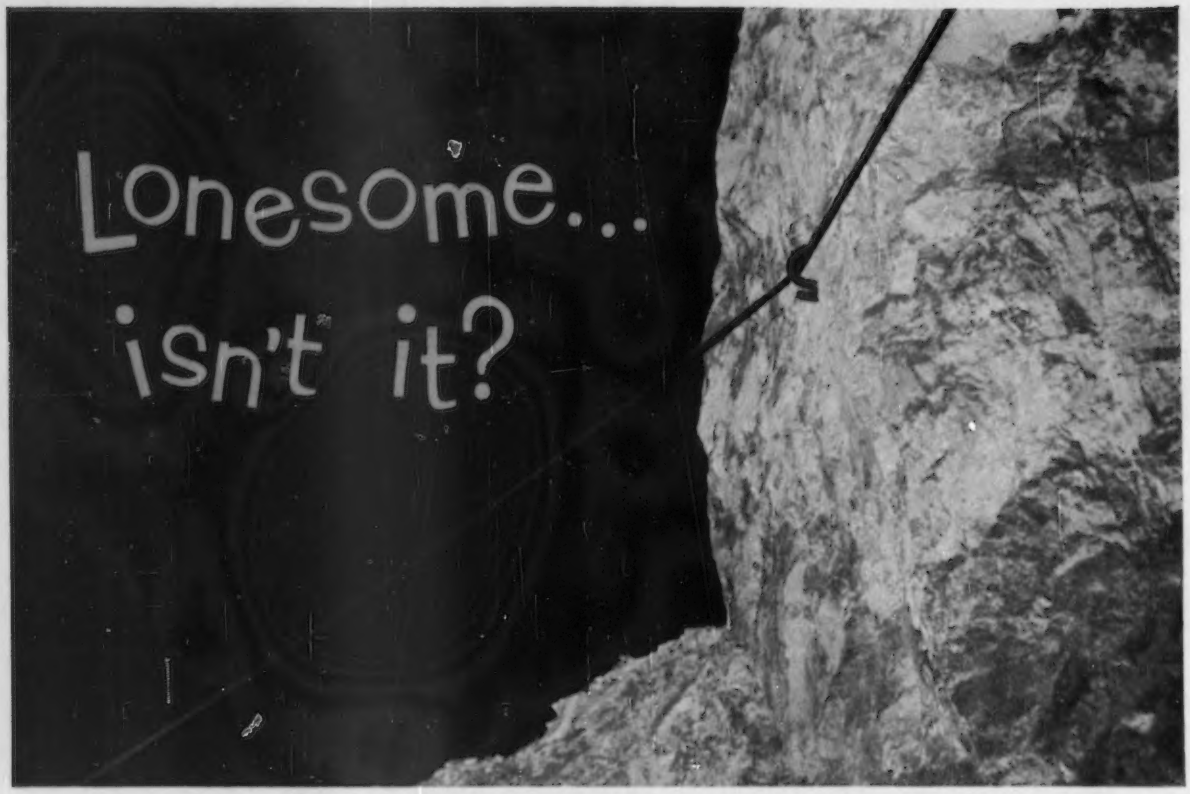


Photo courtesy American Zinc Co. of Tennessee

This Simplex-TIREX Cable carries 250-volt D.C. power to a 25-horsepower slusher hoist 800 feet from the main power line. The cable runs from pillar to pillar and is supported every fifty feet by a cane-shaped hanger wedged into the pillar.

The scraping of many hundreds of tons of ore per day rests upon the consistently satisfactory performance of this lone cable. Here is an operation where "cost cutting" by buying cheap cable simply cannot result in profit. Dependable day-in, day-out operation are primary requisites. Profits rest on it.

Simplex-TIREX Portable Cables are quality cables. They are engineered and manufactured to meet the toughest, most difficult operations that mining affords. They will withstand the blows of falling ore, spalling rock, etc. TIREX Cables were first made more than 35 years ago to meet and overcome the problems peculiar to mining. That's why you will find TIREX wherever you find mining.

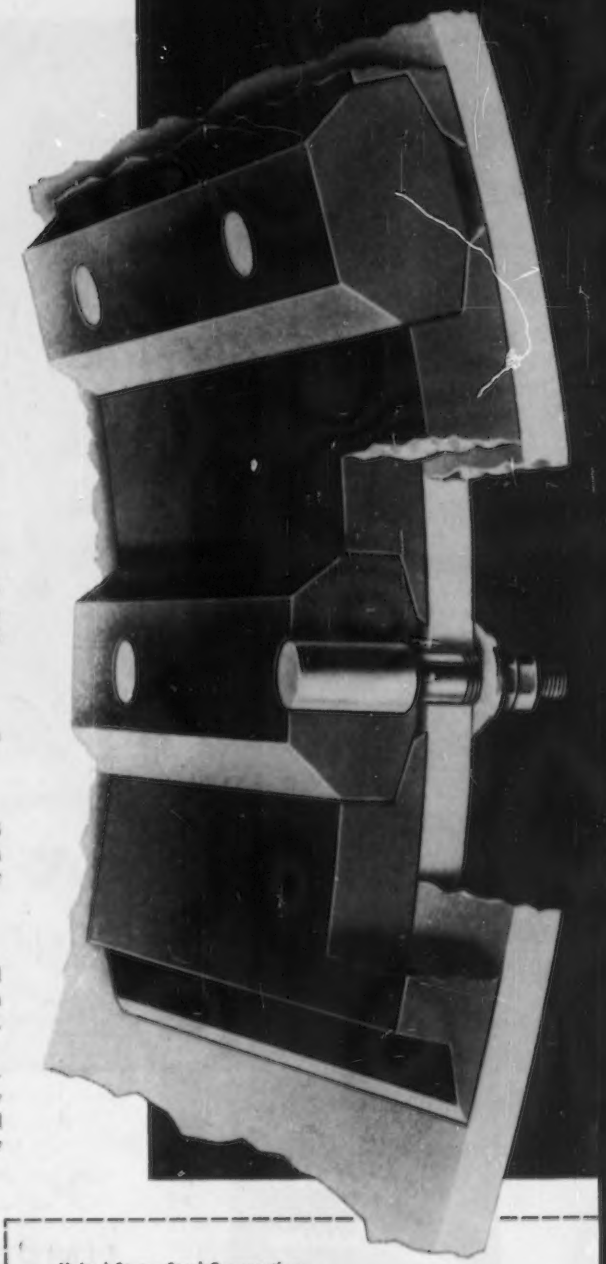
Simplex-TIREX Cords and Cables are cured in lead to give you longer service. They are the only cord or cable that have the famous Selenium Neoprene Armor. When you next need a portable cable for slusher hoists, for loading operations, for electric locomotives, or for any other mining service, be sure that you specify and then insist that you get Simplex-TIREX Portable Cables.

Simplex

TIREX CORDS AND CABLES *are made only by the*

SIMPLEX WIRE & CABLE CO., 79 Sidney St., Cambridge 39, Mass.

You can cut grinding costs four ways with USS Lorain Rolled Plate Linings



1. Less "down-time" for repairs . . .

You get longer, uninterrupted service with USS Lorain Rolled Plate Linings because tight fit between the ends of the plates and between the plates and lift bars eliminates shell wash and allied troubles that eventually cause costly repairs.

2. Less time to install . . .

USS Lorain Rolled Plate Linings are made to accurate size and in easy-to-handle sections that cut labor costs involved in installation.

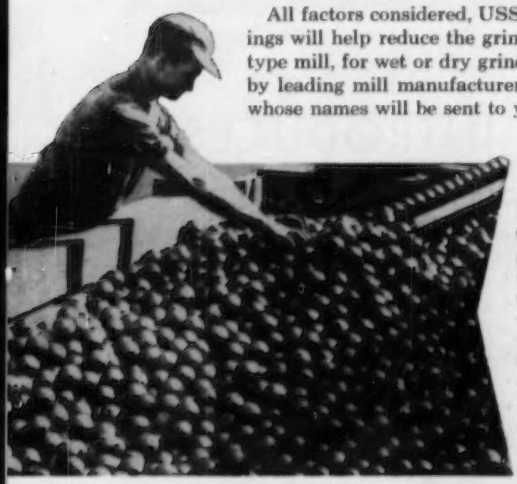
3. More grinding area . . .

Due to the great strength and abrasion-resisting qualities of USS Lorain Rolled Plate Linings, you can safely use thinner plates than would be required with less rugged materials. This permits greater usable diameter . . . increased output for each load.

4. Full grinding value from each plate . . .

You get maximum length of service from each USS Lorain Rolled Plate Lining. And severe localized wear at the feed or discharge ends can be easily compensated for by reversing the worn plates at opposite ends.

All factors considered, USS Lorain Rolled Plate Linings will help reduce the grinding costs-per-ton, in any type mill, for wet or dry grinding. They are distributed by leading mill manufacturers throughout the country whose names will be sent to you upon request.



USS Grinding Balls are carefully made of special composition steel to take long, rough wear evenly. Samples from each production lot are thoroughly checked for surface hardness and maximum hardness penetration. They are available in sizes from ¾" to 5". For further information, mail the coupon.

United States Steel Corporation
Room 4580, 525 William Penn Place
Pittsburgh 30, Pa.

Without obligation on my part, please send me your FREE booklet on USS Grinding Balls.

Name .....

Company .....

Address .....

City ..... State .....

UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS LORAIN ROLLED PLATE LININGS *and* USS GRINDING BALLS

USS

4-2072

UNITED STATES STEEL

Announcing A **New** TYPE HMS SEPARATORY VESSEL

U. S. and Foreign Patents Pending

Send for Information on Complete Pilot Plant Demonstration and Testing Services

OCC

'OCC' VESSEL INTRODUCES UNPRECEDENTED SIMPLICITY

The new OCC vessel represents the successful realization of the main advantage of the HMS process:—its utter simplicity. The simplicity and efficiency of the OCC vessel are shown by these 6 noteworthy features:—

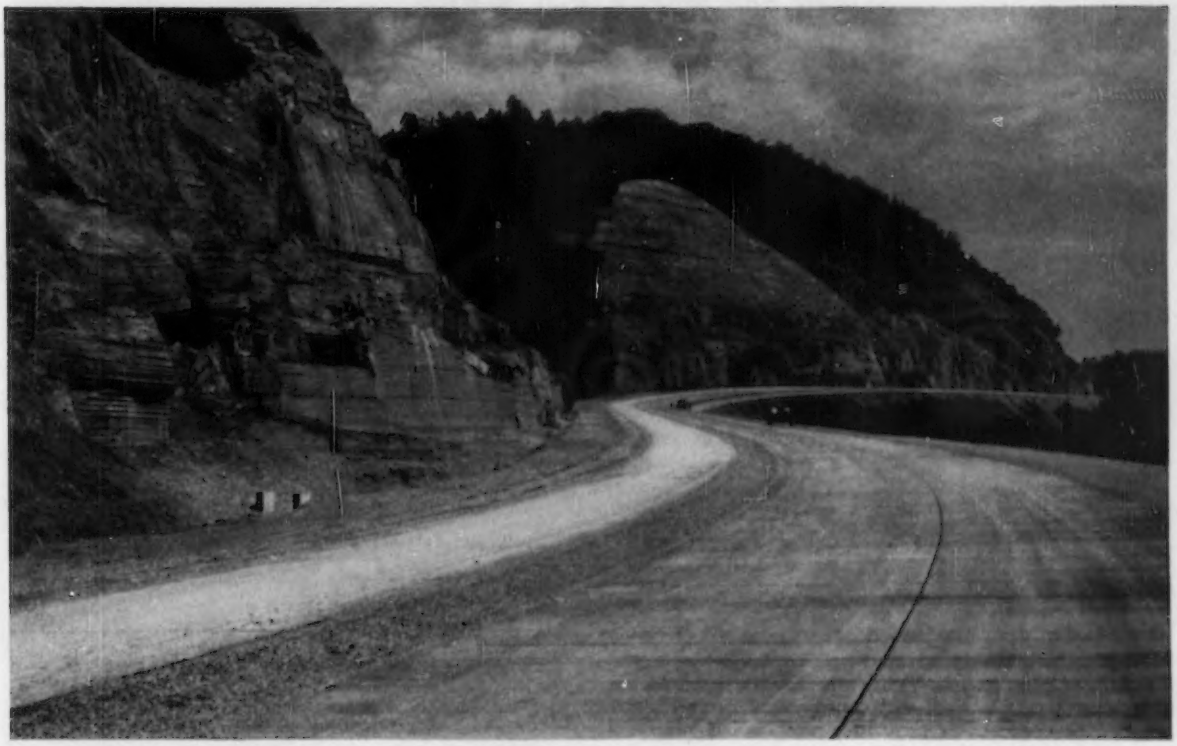
- High separating efficiency.
- Low operating, maintenance costs.
- No rotating parts in the medium.
- Open vessel; separation visible.
- Quiet pool; no adverse turbulence.
- Quickly adjustable rake speed.

Complete HMS testing, plant designing and installation services.

THE ORE & CHEMICAL CORPORATION

. . . . . *Division: Mining & Milling Machinery* . . . . . .

80 BROAD STREET, NEW YORK 4, N. Y.



The 88-mile West Virginia Turnpike, built through terrain such as this, affords motorists some of the nation's most breathtaking scenery.

Removing 250,000 cu yd of Sandstone for West Virginia Turnpike

The motorist driving over the West Virginia Turnpike and struck by its scenic grandeur would never imagine what a herculean job of grading and rock removal made this new highway possible.

Extending 88 miles from Charleston, the state's capital, to Princeton, near the Virginia line, the Turnpike traverses part of the rugged Allegheny Plateau, plus a complex network of winding streams, canyons and sharply pitched hills—hardly an ideal terrain for road building.

One of the contracts on this superhighway called for removal of some 250,000 cu yd of high-silica-content sandstone about 7 miles north of Princeton. The contractor, Clement Brothers Construction Co., Lenoir, N. C., used wagon drills equipped exclusively with Bethlehem 1¼-in. round hollow drill steel, fitted with carbide-insert bits. Blast holes ranged to 24 ft in depth. Reconditioning was done by Acme Machinery Company, Williamson, W. Va.

Bethlehem Hollow is generally found in the thick of things in the country's important construction projects. And you can always count on it for the same kind of steady, economical performance it contributed in helping to build the West Virginia Turnpike.

Left to right: Mack Johnson, drill foreman, and Fred Clement, superintendent, both of Clement Brothers Construction Co., with John Persinger, Acme Machinery Co.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

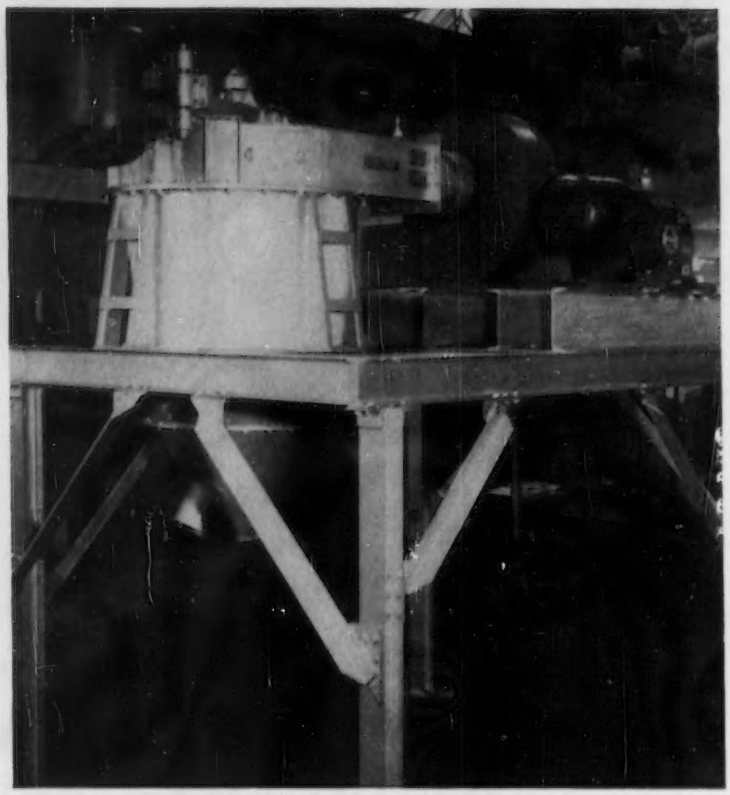
BETHLEHEM STEEL

BETHLEHEM HOLLOW DRILL STEEL

TWO GRADES: CARBON • ULTRA-ALLOY (chrome moly)

NEW TYPE STURTEVANT AIR SEPARATOR

Recovers Fines in Micron Ranges



Now the famous Sturtevant Whirlwind Air Separator, so widely used throughout industry for fast recovery of fines, has been specially designed to "pick-off" classified materials such as pigments, limestone fillers, plastics, oyster shells, etc., in micron sizes.

These highly efficient air separators select a continuously uniform product of desired fineness. Used in a closed circuit with grinding mills, they increase production, cut power costs.

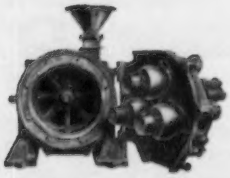
Large feed opening, rugged construction, ease of adjustment, low power consumption assure economy of operation and minimum upkeep. Write for further information.

STURTEVANT
MILL COMPANY
101 CLAYTON STREET
BOSTON 22, MASS.

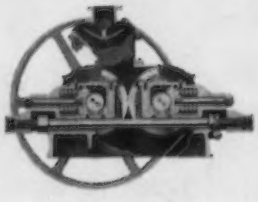
Designers and Manufacturers of:
CRUSHERS • GRINDERS • SEPARATORS
CONVEYORS • MECHANICAL DENS and
EXCAVATORS • ELEVATORS • MIXERS

OTHER STURTEVANT EQUIPMENT

MICRONIZER® GRINDING MACHINE
A fluid jet grinding machine, the Sturtevant Micronizer speeds reduction of materials to low micron sizes. These jet mills are especially applicable in fields where a particle size in microns is desired.
Sturtevant Micronizer grinding machines are available in many sizes and capacities.



RING-ROLL MILLS
For medium and fine reduction (10 to 200 mesh), hard or soft materials. Very durable, small power. Operate in closed circuit with Screen or Air Separator. Open door accessibility. Many sizes. No scrapers, plows, pushers, or shields.



CRUSHING ROLLS
For granulation, coarse or fine, hard or soft materials. Automatic adjustments. Crushing shocks balanced. For dry or wet reduction. Sizes 8 x 5 to 38 x 20. The standard for abrasives.

BLENDER
Four-way mixing action assures a thoroughly blended product. Open-door accessibility permits easy cleaning. Available in many mixing capacities for ¼-ton per hour and up.

DRAWPOINT LOADING WITH EIMCOS

Drawpoints can, with few exceptions, be used in any mining system. This economical production method is gaining in popularity and has numerous advantages in lower costs, higher production and greater safety.

Eimco has been able to reprint some of the numerous articles from mining journals and has gathered much original material. This information is now available in printed form.

Write for the L-1017 series of publications for information on Eimcos in drawpoint loading.

THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Texas Birmingham, Ala. Duluth, Minn. Kellogg, Ida. London, Eng. Paris, France Milan, Italy

Crucible Hollow Drill Rods bite into typical hard rock section along New York State's new thruway near Nyack, New York.

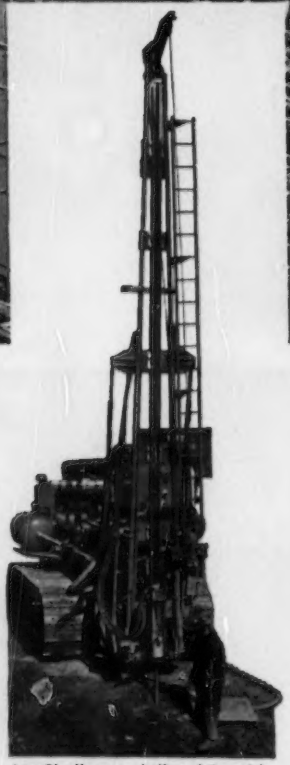
CRUCIBLE HOLLOW DRILL RODS

on the firing line —New York State Thruway

Chewing through hard rock sections of the New York Thruway, Crucible Hollow Drill Rods are helping to build this modern, high-speed highway across the state.

To make this motorist's dream come true meant careful planning by highway engineers—cooperation of dozens of contractors—top quality equipment. That's why large quantities of Crucible Hollow Drill Rods are being used. For experienced construction men *know* they can always depend upon Crucible Hollow Drill Rods for uniformly high performance in the field.

Crucible makes its hollow drill rods to *tool steel standards*. And that means *extra* quality . . . fewer broken rods and lost bits . . . *lowest cost per foot of hole drilled*. Make all *your* drilling jobs go smoothly—specify Crucible Hollow Drill Rods. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 30, Pa.*

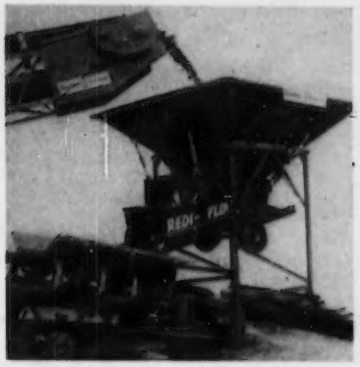


Joy Challenger drill and Crucible Hollow Drill Rod at work on New York State Thruway, Arden, N.Y.

CRUCIBLE first name in special purpose steels

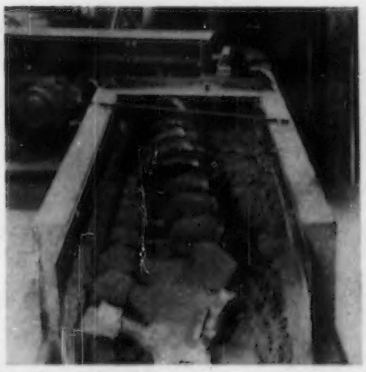
Crucible Steel Company of America

E&MJ NEW PRODUCTS DIGEST



VIBRATING FEEDER

"Redi-Flow", light-weight, low-cost vibrating feeder is made in 20- and 26-in. widths for feeding 24- and 30-in. belts. Lumps up to 12-in. can be handled when mixed with fines, or to an 8-in. maximum when lumps are uniform in size. Capacity is dependent on size and type of material but averages 200 tph for the 20-in. unit and 300 tph or more for the 26-in. unit, according to the manufacturer, Barber-Greene Co., Aurora, Ill. (1)



MIXING MACHINES

Continuous-type mixing and plugging machines, engineered to handle any size material from dust to 1½ in., dry or as a slurry, are now available from Colonial Iron Works Co., Cleveland, Ohio. Mixers are manufactured in standard sizes and permit all advantages of continuous processing over batch processing. (2)

LUBRICATION

Large capacity constant level oilers automatically maintain a constant level of oil in large ring or ball bearing chambers, pump and gear housings. Reservoirs of 10 oz to 2½ qt are available in Lucite or Pyrex glass. Trico Fuse Mfg. Co., Milwaukee, Wisc. (3)

ELECTRIC HOISTS

A series of 8- and 10-ton capacity electric hoists is available from R. G. LeTourneau, Inc., Longview, Texas. Headroom is about 37 in. and lift height 15 ft and up. You have your choice of four mountings; plain trolley, hand-geared trolley, motor driven trolley, and lug mounting. (4)

TRACTOR CABS

Roomy, reinforced cabs for Caterpillar #6 shovels are a recent addition to line made by Crenlo, Inc., Rochester, Minn. Included among several options is tinted glass. For prices and more information use the free reply-card service. (5)

SWIVEL FRAME FOR TRUCK

"Swivel frame" makes it possible for the front and rear halves of a truck to rotate to either side independently. Keeps all four wheels on the ground no matter how rugged the terrain, and eliminates frame twist with its resulting maintainance costs. For complete information on how this remarkable innovation works, take advantage of the postage-free reply-card service below. Truckstell Mfg. Co., Cleveland, Ohio. (6)

ALUMINUM TRUCK BODIES

By saving almost 50% of the weight of a comparable steel structure, the aluminum dump body allows greater payloads under legal loading limits. In addition, says Aluminum Company of America, maintenance costs on an aluminum body are considerably lower. Penn Body Div., Hockensmith Corp., Penn, Pa., puts out this all-welded aluminum body. (7)

E&MJ NEW PRODUCTS DIGEST

ROTARY DRILL

Self-contained, truck-mounted rotary drill employs both compressed air and high pressure water. Available in capacities up to 2500 ft of 8-in. hole from Davey Compressor Co. **(8)**

PACKING SELECTOR

Here's a handy device if you are one of the thousands of users of industrial packing. It's a packing selector that makes child's play out of choosing the right packing for almost any application in a matter of seconds. To get yours use postage-free reply card. New York Belting & Packing Co., Passaic, N. J. **(9)**

SEPARATOR

New tangential discharge spouts, replacing rectangular one on Sweco vibrating screen separator are new design feature on both 48 and 18-in. separators. The separators use a gyratory motion imparted by a vertically mounted motor and the tangential shape spouts permit greater efficiency and speed to develop in material as it spirals out on screen through discharge frame wall. **(10)**

WET CYCLONES

Dorr Co. (Now Dorr-Oliver Inc.), Stamford, Conn., has announced the redesign of standard 6, 12, and 24-in. DorrClones. They now have replaceable molded rubber inserts. In the 6-in. unit, the rubber lined conical casting has been replaced by a two-piece cylindrical casting into which five molded rubber sections are fitted. **(11)**

HAILER

What you see above is an "Audio Hailer." It's an electronic megaphone, capable of magnifying the human voice 1,000 times. It requires 5 flashlight batteries, weighs only 5 lb. Seems like a natural for open pit supervisors. **(12)**

WOUND-ROTOR MOTOR

What is believed to be the first rib-type enclosed, fan-cooled, wound rotor motor to be made with slip rings, brushing rigging, rotor and stator inside a single frame enclosure, has been announced by Allis-Chalmers Mfg. Corp., Milwaukee, Wis. This amazing creation is available at 1800 rpm and slower speeds in frames 284 to 505, in standard enclosed or explosion-proof construction. **(13)**

LIQUID LEVEL MEASUREMENT

Use of the Neher-White Ionization Chamber and a harmless radioactive source permits high accuracy in liquid level indication miles from the point of measurement. Only two connecting wires are required between measuring point and indicating station. Simple inexpensive mercury batteries provide continuous power for one year without replacement. Contact with liquid not necessary. Jordan Electronic Mfg. Co., Inc., Pasadena, Calif. **(14)**

HEAVY DUTY FEEDER

Heavy tonnage vibratory feeder, Model F-86, has been announced by Syntron Co., Homer City, Pa. With a 54x72-in. flat pan trough, maximum feeding capacity is 750 tph of bulk materials. Using Syntron's electromagnetic principle 220- or 440-v ac produces 3600 conveying vibrations per minute. Feed is regulated over a wide range by a dial switch. **(15)**

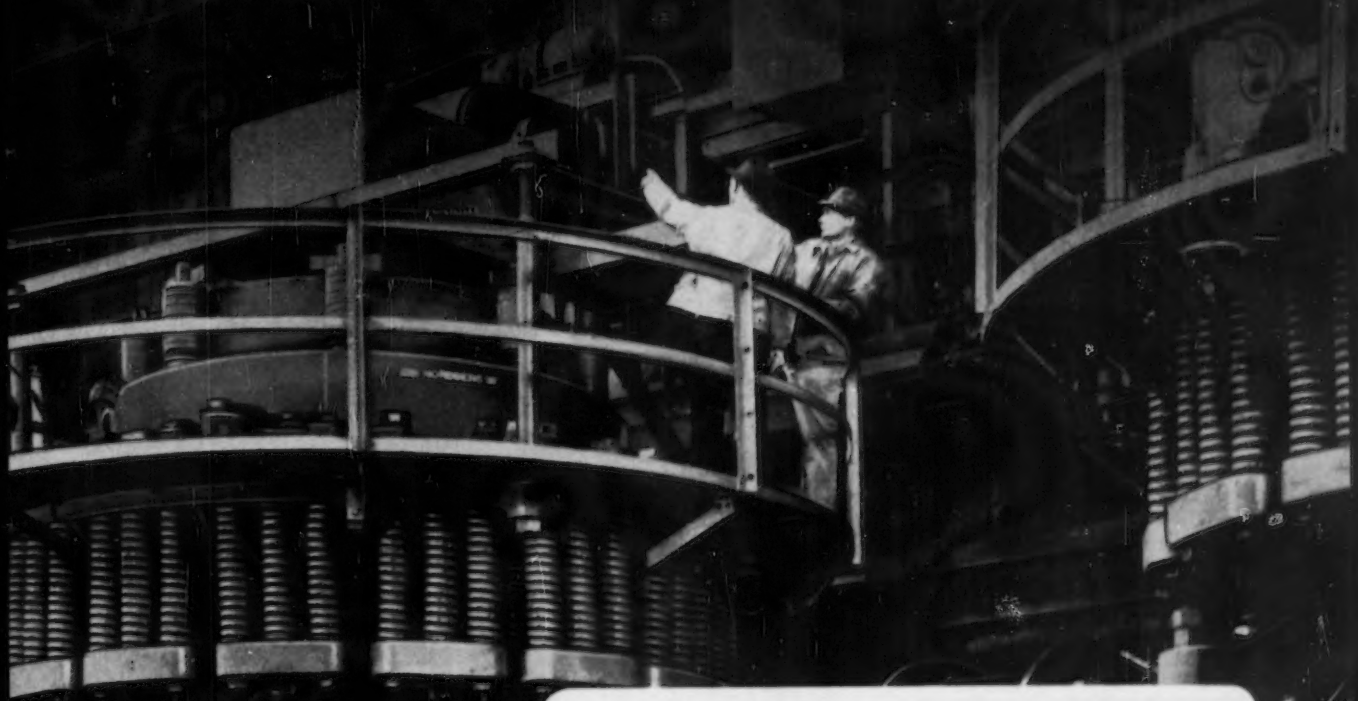
REFRACTORY GUN

For quick, economical repairing of furnace linings, take a look at the new BRI gun, Model A-20, introduced by Basic Refractories, Inc., Cleveland, Ohio. Greater simplicity, more rugged construction and a 20-cu ft hopper are the features. Another improvement over earlier models is the addition of an operator's platform. **(16)**

VIBRATING SCREEN

A new king-size vibrating screen, called Eliptex E-13, represents an increase of from 30 to 40% in capacity over smaller models. Among the features is the fact that, despite its enormous size, the screen will retain the live action, three-way

TACONITE...
and Symons® Cone Crushers



● SYMONS® CONE CRUSHERS . . . *the machines that revolutionized crushing practice* . . . have long proved their efficiency, dependability and economy in the profitable reduction of ores and minerals the world over. In the case of *TACONITE,* one of the hardest and toughest of all ores to process, the mining fraternity again depends on Symons Cone Crushers for the economical production of large tonnages of Taconite Iron Ore . . . as evidenced by the many Symons Cones in successful service, or on order, for the leading producers of Taconite Iron Ore in Norway and in the Lake Superior Iron Ore region.

While *your* crushing problems may not involve Taconite, you may be sure that the crushers used for processing this extremely hard material are the logical choice for practically any other large capacity ore and mineral reduction job.

NORDBERG MFG. CO., Milwaukee, Wisconsin C254

SYMONS . . . A REGISTERED NORDBERG TRADEMARK KNOWN THROUGHOUT THE WORLD

SYMONS PRIMARY GYRATORY CRUSHERS | MINE HOISTS | GRINDING MILLS | SYMONS VIBRATING GRIZZLIES and SCREENS | DIESEL ENGINES

View shows two of several 7' Symons Super Heavy Duty Short Head Cone Crushers installed in the Lake Superior region.

NORDBERG

MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS

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HOW BUCYRUS-ERIE INDIVIDUAL DESIGN*

Helps Cut Costs Two Ways

1. LOWER YARDAGE COSTS

2. LOWER MAINTENANCE COSTS

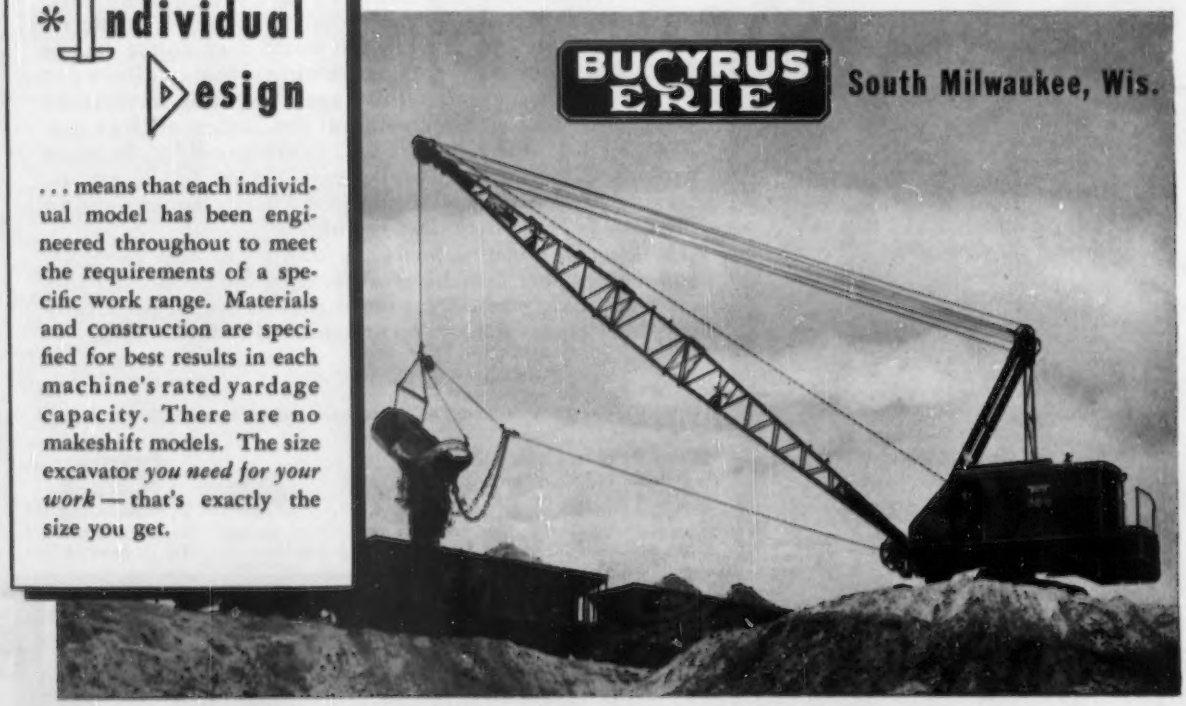
Individual Design engineering brings you what you need for sustained high output over the long pull. Bucyrus-Erie machines are built with just the right combination of power, strength, speed, and weight for economical operation and big output. There's no excess weight, no "over-engineering" to waste power or to slow down performance.

Individual Design is the key to the outstanding dependability and long machine life that Bucyrus-Erie owners expect and get with their machines. Each part of each model is designed to operate at peak efficiency well within safe limits; each has ample strength to carry its share of the work load and to deliver long service life. 25E54

SEE *your Bucyrus-Erie distributor for the complete story on how Individual Design can help reduce the cost-per-yard of output on your mining operation.*

***Individual Design**

. . . means that each individual model has been engineered throughout to meet the requirements of a specific work range. Materials and construction are specified for best results in each machine's rated yardage capacity. There are no makeshift models. The size excavator *you need for your work* — that's exactly the size you get.



NEW YORK • SAN FRANCISCO • DULUTH • WASHINGTON
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vibration built into smaller models, assuring high capacity, fast processing and sharp sizing, says the manufacturer, Hewitt-Robins Inc., Stamford, Conn. **(17)**

PORTABLE COMPRESSORS

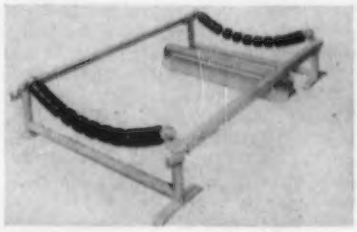
Complete line of rotary compressors in 125, 210, 365 and 600 cfm sizes made by Chicago Pneumatic Tool Co., New York, N. Y., is now available through dealers. These "Power Vane" compressors are said to weigh less than piston type units of half their capacity and occupy 30% less space than equivalent piston types. **(18)**

AIR CLUTCH

The new Dodge Air-Grip responds instantly to a touch of the throttle because a minimum of air is used in operation of the clutch. This sensitivity provides the ability either to "inch" the clutch or throw it into full engagement as required. Instant disengagement is achieved by use of quick release valves built into the clutch itself. It is interchangeable with mechanical clutches and is available from stock in single and double plate models from 8.5 to 806 hp per 100 rpm at 80 psi. Dodge Mfg. Co., Mishawaka, Ind. **(19)**

SHOVEL, CRANE & DRAGLINE

Balwin-Lima-Hamilton Corp., Lima, Ohio, has consolidated its manufacturing program to include production of rubber-tired, one and two-engine carriers for its 20 to 50-ton capacity shovels, cranes and draglines. **(20)**

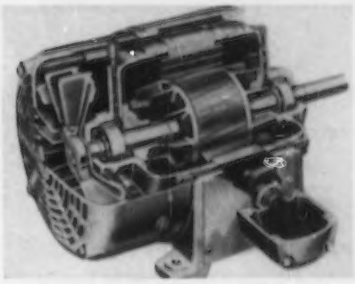


FLEXIBLE CONVEYOR IDLER

A cable suspension idler for belt conveyors provides a load-conforming catenary, cushions the belt and handles both bulk and packaged materials. Known as the "Limberoller," it uses only two bearings and carries the belt on resilient, pressure molded, neoprene discs. Further details on "Limberoller" are offered in Bulletin LD-103. It's available from Joy Mfg. Co., Pittsburgh, Pa., for 24-, 30- and 36-in. belts. **(21)**

STOP CONTROL

Automatic stop control designed to replace mechanical snubbing on vibrating equipment with smooth electrical braking action has been announced by Allis-Chalmers Mfg. Co., Milwaukee, Wis. Control supplies electrical energy to plug-stop the motor safely without imposing high torque on motor or drive. **(22)**



CHEMICAL MOTOR

Designed especially for chemical services, the new types SD and SE motors built by U.S. Electrical Motors Inc., Los Angeles, Calif., are totally enclosed, corrosion-protected by a number of special design features. They're produced in ratings from 3 to 150 hp. **(23)**

TRACTOR

American Coleman Co. of Littleton, Colo. has developed an all-purpose industrial tractor that features top speed of 15 to 80 mph; drawbar pull from 5,000 lb. to 30,000 lb; 2-wheel or 4-wheel steering, from 65 to 150 hp. Comes with or without torque converter. For full details circle No. 24 on the postage free reply card opposite page 42. **(24)**

For Your Files

This informative manufacturers' literature is free unless otherwise specified. To obtain bulletins circle their numbers on card below and mail.

BUCYRUS-ERIE PRODUCTS. A new edition of Bucyrus-Erie's general catalog (GC-5A) describing the company's complete line of excavating, drilling and material handling equipment, has been released. Designed for quick reading the 70-page, 2-color catalog features concise copy, condensed specifications and over 100 photo-illustrations of Bucyrus-Erie machines on specific jobs. Bucyrus-Erie Co., South Milwaukee, Wis. **(51)**

STEEL. In the booklet, "United States Steel Presents T-1," you will find on pages 10 to 15 valuable data on pressure vessel construction developed as a result of "Operation T-1," which should prove highly interesting to the design engineer and fabricator. Additional information is given on the performance of T-1 Steel in other applications . . . in all of which it is cutting operating and maintenance costs. United States Steel Corp., Pittsburgh, Pa. **(52)**

MECHANICAL DRIVE TURBINES. General Electric Co.'s Type DP mechanical-drive turbine rated from 10 to 1200 hp and 1000 to 6500 rpm are described in a revised bulletin designated GEA-4955B. Special design features as well as applications for pumps, compressors, fans, blowers, and similar equipment are covered in the publication. Cutaways, schematic drawings, and photos of DP features are included. General Electric Co., Schenectady, N. Y. **(53)**

LINK-BELT PRODUCTS. New 340-page standard products Catalog 950, providing easy and rapid selection, has been published by Link-Belt Co., Chicago, Ill. Major classifications include chains and sprockets for conveying, elevating and power transmission. Tables of pre-engineered drives facilitates the selection of standard roller chain drives and silent chain drives. Complete listing are given of stock and made-to-order chains and sprockets. **(54)**

AIR CONTROL VALVES. Three fundamental types of air control valves are described and illustrated in a new four-color, 12-page booklet published by Ross

GREATER FOOTAGE at LOWER COST

with Sprague & Henwood's

"ORIENTED" Diamond Bits

That's our story in a nut shell and we're proving it every day—not only in our own world-wide contract core drilling operations, but also through the money-saving results being achieved by hundreds of other satisfied users.

After extensive comparative tests had demonstrated to our satisfaction that drill diamonds cut much faster and last much longer when "oriented" in the matrix with their hardest edge or "vector" toward the work, we decided that random setting was both inefficient and wasteful. Since then we have standardized on oriented diamond bits and have produced THOUSANDS — in a wide variety of types and sizes; with both cast- and powdered-metal matrices.

Only selected diamonds of suitable crystaline structure can be used and only specially trained and equipped setters of more than usual aptitude can be relied upon to orient diamonds correctly in the mold, but we are now fully organized for efficient production of ORIENTED DIAMOND BITS, at no additional cost to purchasers.

In terms of footage cost, these are the most economical diamond bits ever produced and we invite inquiries on that basis.

Bulletin 320 illustrates and describes all types and gives complete working data. Write for a free copy and tell us about your diamond drilling requirements. Our experienced executives welcome opportunities to make money-saving suggestions without charge or obligation.

Sprague & Henwood, Inc.

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E&MJ NEW PRODUCTS DIGEST

Operating Valve Co., Detroit, Mich. The booklet also explains the primary advantages of air power including speed, cleanliness, economy, resiliency and lightness. **(55)**

REFLECTION SEISOMOGRAPH. The HTL Model HR system is designed for extremely shallow reflection work and provides seismic information in the depth range of 100 to 2500 ft. In mining exploration it furnishes data for mapping depth and extent of overburden and buried channels. It makes possible the application of the seismic technique, long a primary exploration tool of the petroleum industry, to the location and delineation of dikes and other intrusives, shallow mineral beds or seams, and similar features. Houston Technical Laboratories, Houston, Texas. **(56)**

GRINDING WHEELS. Condensed Catalog 1052 of the most widely used grinding wheels carried in stock has just been published by Norton Co., Worcester, Mass. A principal feature of the catalog is the supplement of net prices to the customer in various quantity lots. This 28-page illustrated booklet covers the subject of grinding wheel selection in considerable detail. Points covered include abrasive types, bonding materials, wheel speeds, wheel markings, standard wheel shapes, mounted points, and abrasive polishing grain. **(57)**

MICROSCOPE SELECTION. A 28-page guide, Booklet D-185, to assist science educators, researchers, laboratory technicians and other microscopists in selecting the microscopes and accessories to meet their specific needs is available from Bausch & Lomb Optical Co., Rochester, N. Y. Uses, performance data, and specifications on more than 60 different microscope models and accessories are outlined. **(58)**

DIESEL ENGINES. Eight money-making features of a variety of diesel engine applications are described in "Cat Diesel Engines Plus Hydraulic Torque Converters," published by Caterpillar Tractor Co., Peoria, Ill. This 16 page booklet contains job descriptions and numerous photographs of some of the many applications where torque-converter-equipped diesel engines have proved themselves profitable. **(59)**

SAFETY. Accidents add to the cost of doing business. That's the theme of the National Safety Council's new booklet, "Plus Cost." Tells concisely how accidents nibble at profits and outlines the "why" and "how" of accident control. Intended specifically for those small firms with relatively few employees and no safety staff, "Plus Costs" sets down seven easy steps for eliminating accidents and suggests sources of help. Small Business Program, National Safety Council, Chicago, Ill. **(60)**

MOTOR PULLEYS. Complete redesign of the standard line of Reeves Vari-Speed Motor Pulleys is described in a 28-page multicolor catalog V-545, available from Reeves Pulley Co., Columbus, Indiana. New design motor pulley, engineered for new NEMA frame motors, but usable with old NEMA motors, is available in eight sizes, ranging from ½ to 15 hp and in speed ratios as great as 4:1. **(61)**

GEAR MOTORS. Belgian Electric Sales Corp., New York, N. Y. exclusive sales and service organization for ACEC electric motors and SADI speed reducing equipment in the United States and Canada, has published ACEC-SADI Geared Motor Catalog, #CC-14A, covering the ACEC-SADI line of geared motors built to NEMA specifications. It's a 14-page, technical brochure, including a complete price list, dimensions, operating characteristics, photographs and diagrams. **(62)**

HOSE. Catalog in color, covering the Boston line of water hose and water suction hose, is announced by the Boston Woven Hose & Rubber Co., Boston, Mass. Designed to aid in the selection of hose best suited for particular applications in the widest variety of industrial fields, the catalog lists specifications for each type of water hose as to size, weight, construction and recommended use and working pressures. **(63)**

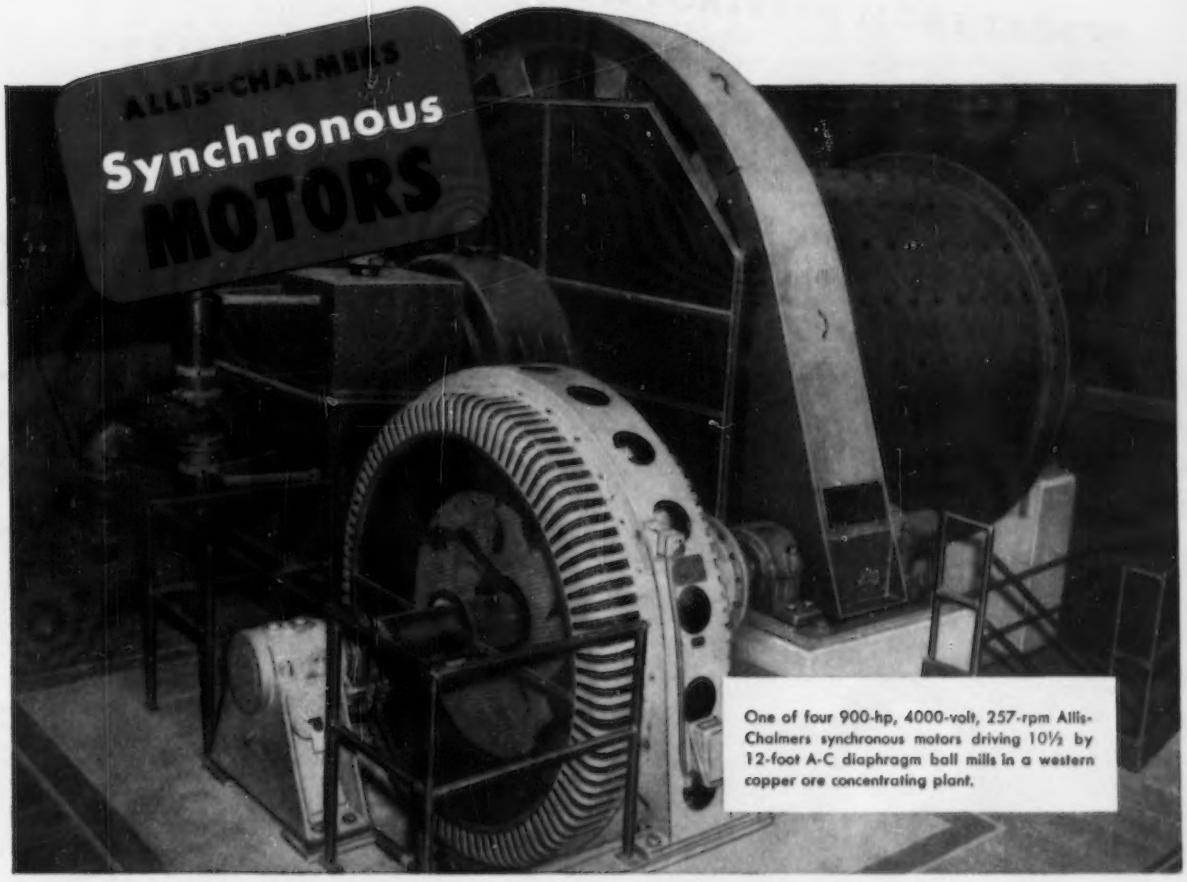
SPROCKETS. Eight-page catalog (C56-54) describing the newly-expanded line of Morse Taper-Lock stock sprockets is now available from Morse Chain Co., Detroit, Mich. **(64)**

DUST, FUME CONTROL. Dorfan Dust and Fume Control System are detailed in a 4-page bulletin published by Mechanical Industries, Inc., Pittsburgh, Pa. In these systems a recirculating or parallel flow granule principle is used for removal of smoke, fumes, moisture and for reclaiming by-products. Dorfan Systems are recommended for the collection of fumes from dryers of all types, electric steel furnaces and a great variety of other installations. They may be installed on existing equipment or in new plants.**(65)**

HEAT EXCHANGERS. Precision fabricated heat exchangers for any process industries application—involving gas to gas, liquid to liquid, liquid to gas, powdered solid to liquid, high pressure to vacuum and temperatures from 280 to 1600 deg F—are described in a new 12-page booklet published by the M. W. Kellogg Co., New York, N. Y. **(66)**

RAPPER FOR COTTRELL. Research-Cottrell, Inc., New York, N. Y., has issued a 6-page bulletin describing the MI Rapper, a device for automatic and continuous cleaning of the collection electrodes in a Cottrell electrostatic precipitator. The bulletin includes a schematic diagram of the rapper, an explanation of its basic operating principles, illustrations of its components, and a summary of its features. **(67)**

POWER TRANSMISSION. Catalog GC-101-B features the complete line of Browning power transmission equipment, consisting of single, and multiple grooves



One of four 900-hp, 4000-volt, 257-rpm Allis-Chalmers synchronous motors driving 10½ by 12-foot A-C diaphragm ball mills in a western copper ore concentrating plant.

Here's Dependable Power for Grinding Mills

Motor design closely coordinated with grinding mill torque requirements and system power factor needs

Many cost-conscious operators, like this western copper ore concentrating plant, choose Allis-Chalmers synchronous motors for peak performance and low maintenance costs. Allis-Chalmers builds both processing machinery and the electrical equipment to drive it. Allis-Chalmers intimate knowledge of operating conditions is full assurance that the motors will not only meet daily operating requirements but will also handle unusual emergency conditions without faltering.

Allis-Chalmers has always been known for building the heavy-duty type of equipment that mining and processing plant operators need. This tradition of generous construction plus the latest in manufacturing, inspection and testing equipment gives you a motor that will deliver many years of economical, trouble-free service.

For more information on synchronous motors that keep costs down, call your Allis-Chalmers representative or write for Bulletin 05B7648. Allis-Chalmers, Milwaukee 1, Wisconsin.

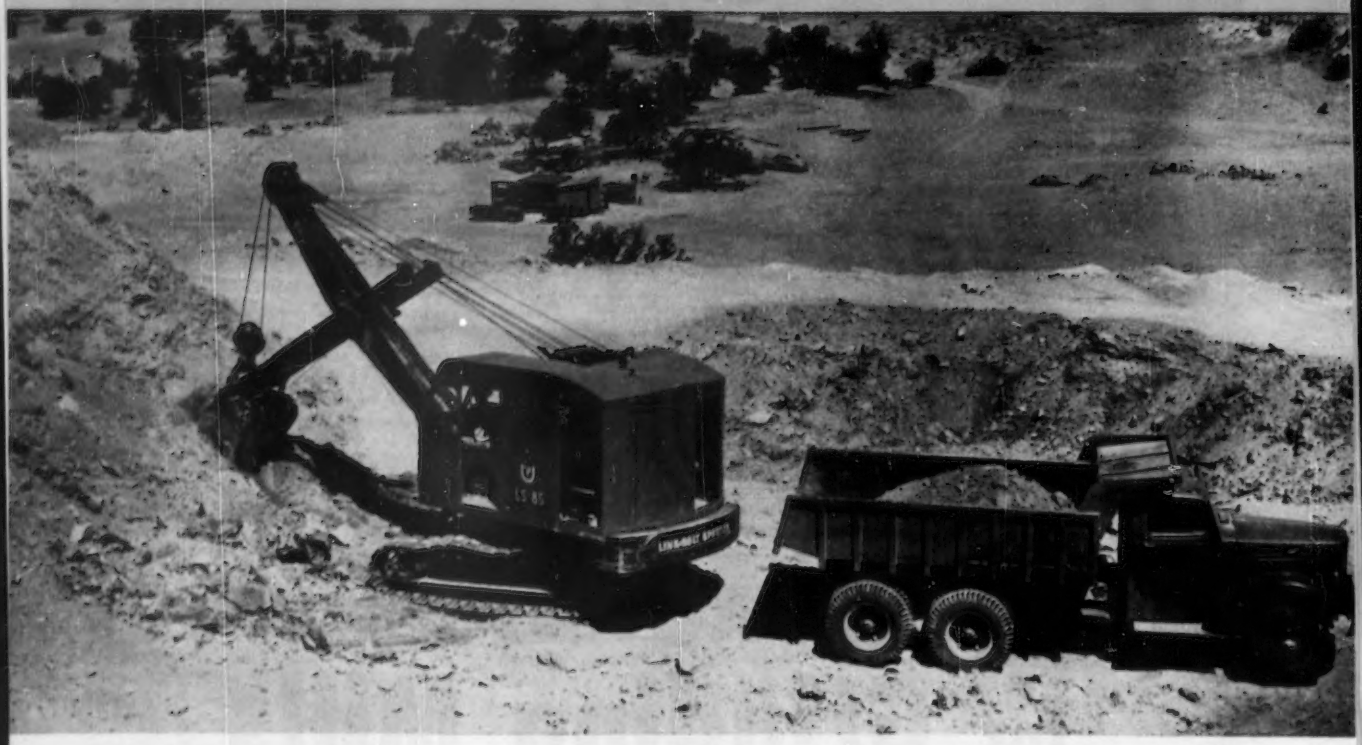
A4552

ALLIS-CHALMERS

REPORT FROM HAYSTACK MOUNTAIN:

CONDITIONS: "VERY ADVERSE"

PERFORMANCE: "IDEAL POWER...TROUBLE-FREE"



High up on the Continental Divide, this ¾-yard Link-Belt Speeder loads crude uranium ore for Haystack Mountain Development Co. In eight months of week-in, week-out operation through climatic extremes and abrasive dust, its Caterpillar D318 Diesel Engine has needed *no repairs*. Ruggedness and freedom from down time are vital in this remote area, about 15 miles northeast of Prewitt, N. M.

"Our Cat* D318 is the ideal power for this equipment. It has been trouble-free in eight months of operating under very adverse conditions," states J. E. Inman, superintendent.

The Caterpillar D318 can cut *your* operating expenses with low first cost, long and reliable work life, high trade-in value. Like all Caterpillar Engines, it can deliver full power and idle without fouling on money-saving No. 2 furnace oil. The economical D318 pictured here averages only 2½ gallons of fuel per work hour!

There are 12 Caterpillar Engines and Electric Sets, to 500 HP and 315 KW. Your Caterpillar Dealer—who provides fast, dependable service and genuine factory parts—will help you select the power that's "tailor-made" to fit *your* needs. And the next time you order new machinery from mining equipment manufacturers, specify Caterpillar power.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

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and variable pitch sheaves; complete line of V-belts, fractional, multiple, steel cable, super, griproll, griplink; couplings, fixed bore and bushed type, rigid and flexible; chain couplings both with and without covers; paper pulleys; keystock; hubs for split bushings; set collars; frictions; cast iron pulleys; complete line of Type A & B and bushed type roller chain sprockets, roller chain, and Poly-V sheaves and Poly-V belts. Browning Mfg. Co., Maysville, Ky. (68)

LIFT TRUCK. Hyster RC-150 Model, 15,000 lb capacity lift truck, is described in a 16-page brochure. In-action photographs, descriptive data and specifications on the model are given. Hyster Co., Portland, Ore. (69)

MULTI-FUEL ENGINES. Bulletin describing and illustrating the 225 to 675 horsepower Le Roi L3460 and L4000 uses cutaway views and studio photos photos to show the advanced design features, such as the integral V-12 cylinder block design, the counter balanced crankshaft, and hydraulic valve lifters, and other features of these engines which are described as the "most modern, most powerful natural gas-butane-gasoline engines in their class." Charts show space savings and horsepower ratings at varying rpm's with LPG fuel and gasoline or natural gas fuel. Le Roi Division of Westinghouse Air Brake Co., Milwaukee. (70)

DIESEL TRACTOR. Inside and out features of the Allis-Chalmers HD-9 Diesel-powered crawler tractor are shown in a three-page cutaway view in catalog now available from the Tractor Division, Allis-Chalmers Mfg. Co., Milwaukee, Wis. Catalog's 30 pages also contain many other illustrations which help tell the engineering, mechanical and operating story of the HD-9. Allied equipment and special accessories match to the HD-9 for maximum operating efficiency by the unit, are also pictured. (71)

COMBUSTIBLE GAS ALARMS. Mine Safety Appliances Co.'s (Pittsburgh, Pa.) complete line of combustible gas analyzers and alarms are described in a 20-page brochure No. 0703-3. Prepared to give details of how these instruments work, the brochure contains part-by-part descriptions of the components of MSA's analyzers. Actual installations in varied industries are fully covered, and a method of designing a combustible gas alarm system is shown schematically. Instruments to protect against most of the known combustible gases and vapors are described. (72)

RUBBER PRODUCTS. Quaker Rubber Corp., division of H. K. Porter Co., Inc., has a 58-page, illustrated, full color catalog which is a must for the mining man. Book is divided into sections on belting, hose, packing and molded rubber products. Sections contain full dope on performance, specifications, sizes and applications. (73)

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Textile-covered, flexible and resilient. Suitable for surface trunk lines and shallow holes where tensile strength and resistance to abrasion and cutting are not required. Tensile strength 113 lbs. 1000-ft. spool 17 lbs.

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Ni-Hard curbs wear of abrasive muck traveling at high speeds and pressures in cyclones used for desliming concentrates. Before starting their operations in White Pine, Mich., the White Pine Copper Co. ordered these Ni-Hard cyclones cast by Staver Foundry Co., Virginia, Minn.

Why a new mine...

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BEFORE INSTALLING UNITS for desliming concentrates, White Pine Copper Company, White Pine, Mich., investigated the performance of NI-HARD® cyclones on the Mesabi range.

White Pine engineers asked users about the wear-resistance of Ni-Hard . . . how the life of Ni-Hard castings compared with that of rubber lined steel or other materials used in cyclones.

Answers received by White Pine boil down to 9 words:

Ni-Hard provides the maximum of abrasion resistance per dollar.

Prove for yourself why mine operators specify Ni-Hard. Try Ni-Hard on *your* tough jobs. Its remarkable resistance to wear cuts downtime of equipment and reduces both operating and replacement costs. INCO TRADE MARK

The completely revised third edition of "Engineering Properties and Applications of Ni-Hard" is now available. Also, the "Buyers' Guide for Ni-Hard Castings." Write for your copies now.

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New *simplicity and sustained efficiency in dust filtering and collection . . .*

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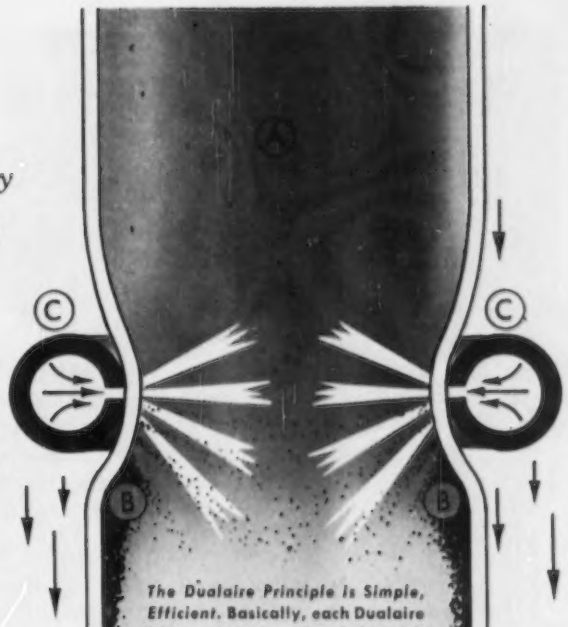
REVERSE-JET DUST COLLECTOR

Efficiencies up to 99.99%

Cloth filter systems of one design or another have long been used by industry for cleaning industrial gases and/or recovering dust or other suspensions. But three problems are common to such systems... (1) Extreme changes in pressure drop and filtering efficiency as dust cakes accumulate on the filter surface... (2) Wide pressure fluctuations and surges in the plant system as filter units become clogged or are cut out and rapped for cleaning... and (3) Rapid deterioration of the filter material by the vibration, shaking and rapping equipment used for cleaning.

But now the DUALAIRE Collector—as engineered by Western Precipitation, pioneers in the field of dust recovery—provides the answer to these and other problems common to conventional bag-house equipment.



The Dualaire Principle is Simple, Efficient. Basically, each Dualaire filter unit consists of a cloth or felt tube, open at both the top and bottom. (A) Dust-laden gases enter at top of the tube and are filtered as they pass through the side walls of the tube to the exhaust system. (B) Dust particles collect on the inside of the tube and *before* the cake builds up sufficiently to affect filter operation, a tubular blow ring (C) automatically starts moving up and down the outside of the filter cylinder. A jet of air, concentrated by this blow ring, reverses the normal gas flow at the point contacted by the ring, thus jetting the dust layer off of the inner surface of the filter tube.

This jetting action is further assisted by a flexing of the filter cylinder as the blow ring passes, thus cracking and loosening the dust layer from the inner surface, from where it drops to the recovery chamber below the bottom of the tube.

The entire operation is positive and simple. The blow ring starts its action *automatically* as soon as the dust layer causes a pre-determined pressure differential. And after the filter surface is cleaned, the blow ring *automatically* stops.

6 ADVANTAGES OF DUALAIRE DESIGN...

PRESSURE DROP remains uniformly low at all times because the dust is removed continuously in *small portions.*

FILTERING EFFICIENCY remains uniformly high at all times without the "choking" action characteristic of conventional bag-houses. Actual field tests show efficiencies as high as 99.99%!

DUST RECOVERY is in steady increments — not in sudden large "batches" as with conventional rapping systems. Thus the Dualaire eliminates surges and detrimental variations in the plant system.

FILTER ELEMENT has a much longer life because it is not subjected to the stresses of rapping or jarring while being cleaned. Dualaire reverse-jet cleaning action is gentle, yet far more effective.

GREAT SAVINGS are also made in space and the size of installation required. Because each Dualaire filter unit is cleaned more-or-less constantly without shut-down, there is no need for costly standby units — or the complicated switching equipment to cut standby equipment in and out.

BASIC UNITS are "sectionalized" and are available in 5 standard heights. Sections can be bolted together in any desired multiple, providing a capacity range to fit virtually any requirement. As needs increase, add more sections.

There are many other advantages built into the DUALAIRE. *For further details send for this descriptive 12 page booklet. Or contact your nearest Western Precipitation representative!*

* ® "Dualaire" & "Multiclone"

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The GISMO offers you an entirely NEW concept of simplicity and economy in mining...

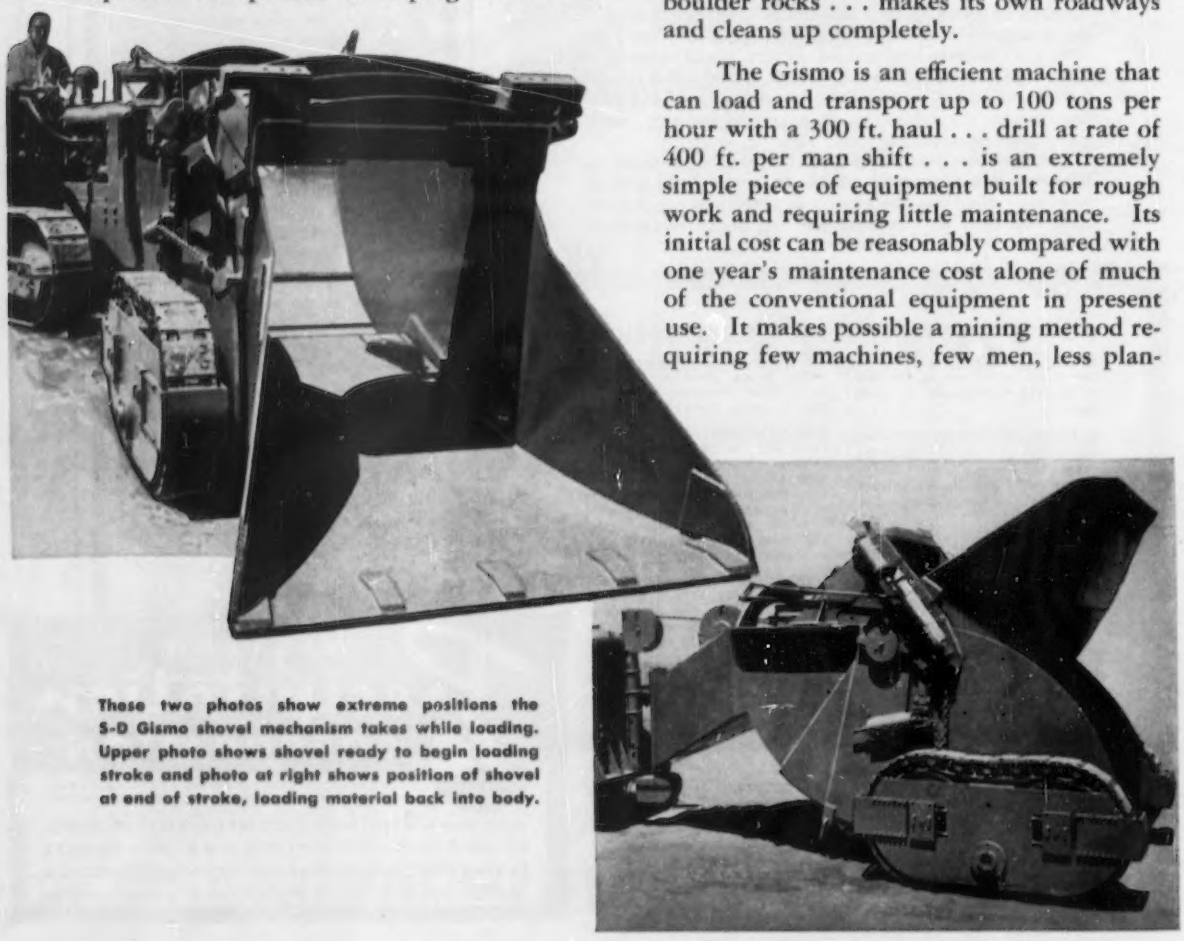
THE GISMO offers you a new method of mining. One that over a period of 2½ years of intensive development in actual work has proved beyond question advantages that merit its thorough investigation by any firm excavating rock or its equivalent.

The Gismo offers you a general purpose utility self-loading transport that is simple, versatile and built to take the brutal punishment of rock excavation—and at important savings! It is well suited to almost all mining conditions. No special development facilities or conditions are usually required. It operates in sloping ore bodies with irregular outlines, as well as large or relatively small openings. The Gismo is easily maneuverable at maximum or minimum speed of the equipment.

With perhaps a few exceptions, the Gismo can be taken into any mine. Its cross sectional dimensions are small compared with other equipment. It can be dis-assembled for lowering through small shafts.

Its versatility meets every requirement. It loads (mucks) in development or production . . . transports . . . drills (supports 2 to 5 jib mounted drills) . . . back fills . . . moves boulder rocks . . . makes its own roadways and cleans up completely.

The Gismo is an efficient machine that can load and transport up to 100 tons per hour with a 300 ft. haul . . . drill at rate of 400 ft. per man shift . . . is an extremely simple piece of equipment built for rough work and requiring little maintenance. Its initial cost can be reasonably compared with one year's maintenance cost alone of much of the conventional equipment in present use. It makes possible a mining method requiring few machines, few men, less plan-



These two photos show extreme positions the S-D Gismo shovel mechanism takes while loading. Upper photo shows shovel ready to begin loading stroke and photo at right shows position of shovel at end of stroke, loading material back into body.

The Gismo does not load by momentum or crash fashion! As it approaches the foot of muck pile, shovel head is eased into pile as simply as a hand shovel into sand. Material is actually shovelled under complete control of operator and within his complete vision. Photo at bottom of page shows Gismo with tractor, operated by only one man.

ning and integration. It allows total mechanization of your mine—the solution to present economic conditions of high man-hour and materials cost, and low metal prices. Contact us for complete information. *Sanford-Day Iron Works, Inc., P. O. Box 1511 . . . Telephone 3-4191, Knoxville, Tennessee.*

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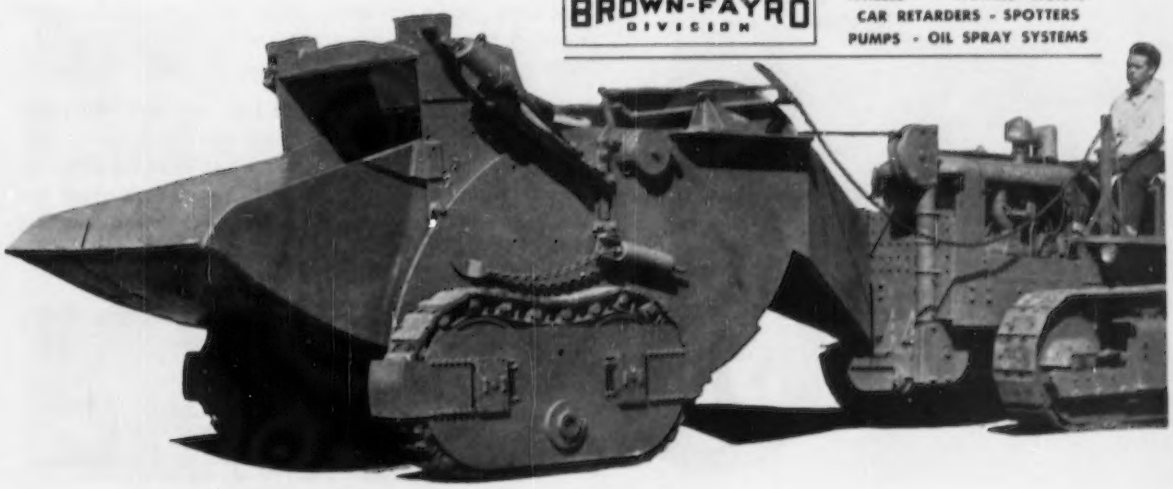

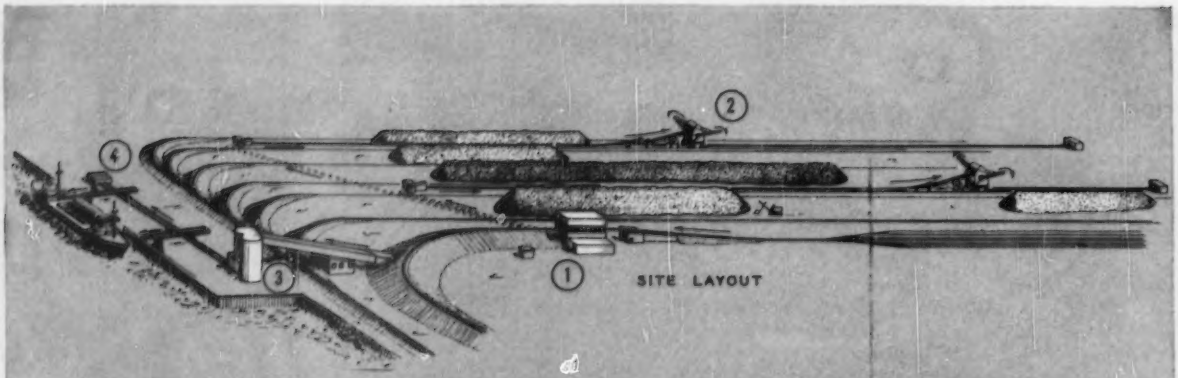

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70,000 TONS a DAY

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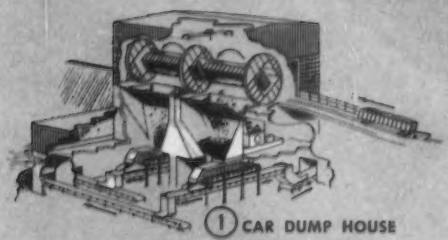

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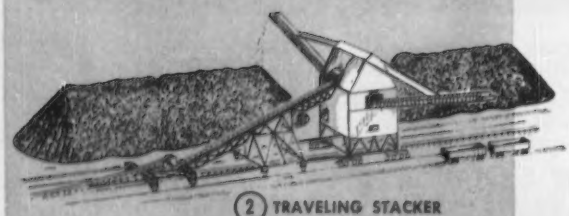

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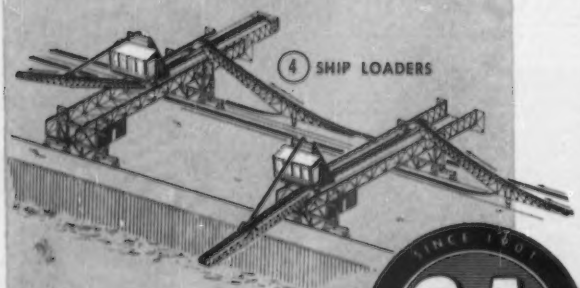
3 OUTHAUL SYSTEM TO DOCK (NOT ILLUSTRATED)



4 SHIP LOADERS

In July of 1954, the first historic shipment of iron ore from Labrador was made from the Port of Seven Islands, Quebec. Carried by rail 360 miles through the wilderness from mine to port, 10 million tons of ore a year will help to meet the insatiable demands of our steel mills.

Stephens-Adamson is proud to have provided the conveying system designed to load or stockpile up to 70,000 tons a day as the mines go into full production.

At the 550-acre marshalling facilities, cars of seven long ore trains each day are emptied by big rotary dumpers onto stationary grizzlies over concrete hoppers. Two lump breakers crush oversize. An S-A Amsco manganese steel feeder carries the ore to two reversible 72" belts which feed either the stocking out or ship loading system.

After the ore has passed through mixing bins at dockside, loaders with a combined capacity of 8,000 tons per hour load even the largest ocean-going ore ships in about five hours. A huge traveling stacker, with boom conveyors extending from either side, forms the stockpiles.

Not many operations require as huge or complex a conveying system as the one at Seven Islands. But, whatever *is needed,* the same S-A engineering skill, backed by half a century and more of experience plus the complete S-A line, is at your service, to meet any bulk materials handling need. Write whenever we can help you.

STEPHENS-ADAMSON MFG. CO.

7 Ridgeway Avenue, Aurora, Illinois
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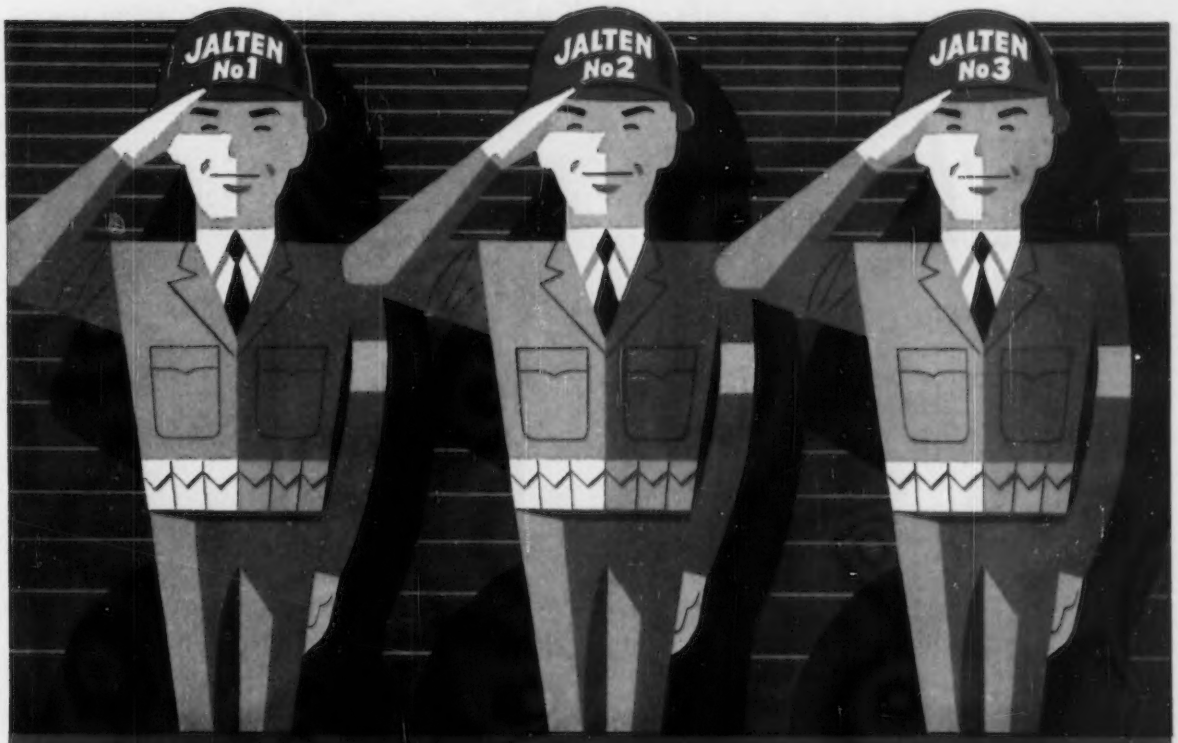
Engineering Division	Specialists in the design and manufacture of all types of bulk materials conveying systems.
Standard Products Division	A complete line of conveyor accessories including centrifugal loaders—car pullers—bin level controls—etc.
Sealmaster Division	A complete line of industrial ball bearing units available in both standard and special housings.



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J&L's New JALTEN series enables you to select low-alloy, high-strength steel in the following combinations of advantages:

JALTEN No. 1 — High strength, good formability and fabricating —good resistance to low temperature impact.

JALTEN No. 2 — High strength, moderate forming—improved resistance to atmospheric corrosion.

JALTEN No. 3 — High strength—improved resistance to abrasion.

Remember to specify JALTEN High Tensile Steel for

- **HIGH STRENGTH • RESISTANCE TO CORROSION**
- **GOOD FORMABILITY • RESISTANCE TO ABRASION**

J&L STEEL

Jones & Laughlin
STEEL CORPORATION — *Pittsburgh*

The data you want is in this book:

- Chemical Properties of Jalten
- Mechanical Properties of Jalten
- Jalten Equivalents
- Jalten Application Data

Jones & Laughlin Steel Corporation
Dept. 412, 3 Gateway Center, Pittsburgh 30, Pa.

Please forward a copy of your booklet, Jalten low-alloy, high-strength steel.

Name_____

Company_____

Address_____

HOW TO BUY CONVEYOR BELTS

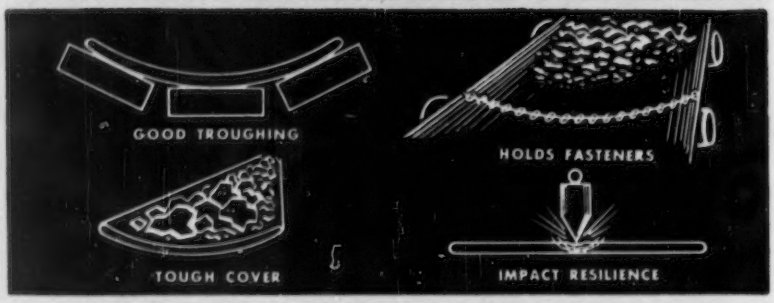
FOR FULL LOADS ON UNEVEN RUNS

...and get "More Use per Dollar"

Look for a belt with engineered features that assure maximum troughability, resistance to gouging, tearing or ripping, and dependable fastener-holding qualities.

Good troughing is the first thing to look for in an efficient, straight running conveyor belt on up and down grades. To trough properly, a belt must have full freedom and flexibility to make adequate contact with the center rollers. Conventional duck belting strong enough to handle the heaviest loads is stiff and "boardy", does not trough readily and consequently causes load spillage . . . especially where belts must follow uneven contours, as in mining operations.

Specify by name the one belt specially built to resist gouging and tearing, to trough deep and carry a full load regardless of the ups and downs of the run . . . specify Ray-Man "F" Conveyor Belts.



RAY-MAN "F" CONVEYOR BELTS

The elastic nature of special strength members and synthetic outer plies (both top and bottom) give Ray-Man "F" Conveyor Belts unusual crosswise flexibility to trough easier. It permits deep loads in narrow widths and has exceptional flexibility around small pulleys for low head-room operations. It requires no breaker strip, yet resists gouging, tearing and ripping better than other constructions and holds fasteners under severe operating conditions.

Let an R/M representative show you the advantages of Ray-Man "F" as well as other R/M feature conveyor belts . . . Homocord, with extra cushion for shock loading . . . Ray-Man Tension-Master for long lifts and high tensions. R/M heavy duty conveyor belts have the exclusive "XDC" Cover that greatly prolongs belt life with its extra protection against wear, tear, cuts and abrasion . . . gives "More Use per Dollar".

RM-501-UB

R/M

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings • Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Bowling Balls

Cyanamid REAGENT NEWS

"ore-dressing ideas you can use"

AEROFROTH® 80 *Frother*

Improves Copper, Silver Recovery

Recent tests showing approximately 3% increase in both copper and silver recovery at a Mexican flotation plant prompted adoption of AEROFROTH 80 Frother in place of cresylic acid. At this property silver occurs in pyrite as well as with copper-bearing sulfides. A bulk float recovers both minerals.

During a recent six-day plant test, cresylic acid was used on one bank of cells, AEROFROTH 80 on the other bank. Both were fed at the rate of 0.15 lb. per ton of ore. Other reagents used are 0.5 lb. soda ash, 0.28 lb. AEROFLOAT® 242 Promoter and 0.2 lb. potassium ethyl xanthate per ton of ore. Results were:

	Cresylic Acid				AEROFROTH 80 Frother			
	Assay		% Recovery		Assay		% Recovery	
	% Cu	Oz/Ton Ag	Cu	Ag	% Cu	Oz/Ton Ag	Cu	Ag
Head	4.29	4.41			4.88	4.74		
Concentrate	28.78	28.53	93.98	90.64	28.55	27.19	96.23	93.38
Tailings	0.30	0.50	6.02	9.36	0.22	0.38	3.77	6.62

The Cyanamid Field Engineer who worked with this operator reports:

"Higher recoveries with AEROFROTH 80 were due to more rapid flotation. The bank of cells fed AEROFROTH 80 carried practically no mineral to the last cell, flotation being complete in the preceding cells. With cresylic acid, sulfide flotation was considerably slower. The froth in the last cell carried considerable mineral".

A Cyanamid Field Engineer will be glad to work with you to determine whether AEROFROTH 80 Frother or other Cyanamid Reagents can increase recovery or cut costs on your mill. A note to our nearest office will have prompt attention.

AMERICAN Cyanamid COMPANY

MINERAL DRESSING DEPARTMENT

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Cable Address — Limenitro, New York

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377 Little Collins St., Melbourne C.1, Australia

Printed in the U. S. A.

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AMSCO LEADER AUTOMATIC ELECTRIC WELDER

Save contractor $10,000 over replacement parts, double service life

If you operate track-type equipment, here's an automatic electric welder that is a *must* for your maintenance shop. It will save you time and money, and radically increase service life of your present equipment.

See what it did for one construction outfit:

Operating five large track-type tractors, each with 12 bottom rollers, 4 carrier rollers, 156 track links, 78 grouser pads, 2 idlers, 2 sprockets and one dozer blade, replacement cost was figured to be approximately $13,800. Rebuilding these parts with the Amsco Leader cost approximately $3,700, or a saving of about $10,000. Plus the fact that the rebuilt parts gave nearly double the effective service life of the new parts.

See your local Amsco Distributor today. Ask him for complete details on the Amsco Leader. See for yourself how a new Amsco Leader can save you thousands of replacement dollars.

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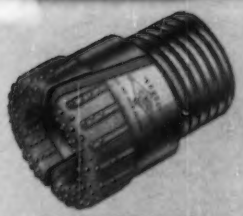


TRUCO CORING BIT

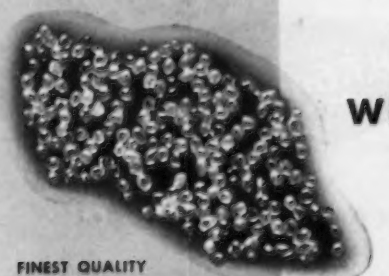
TRUCO CONCAVE BLAST HOLE BIT

TRUCO PILOT BIT

TRUCO IMPREGNATED CORING BIT

TRUCO REAMING SHELLS

TRUCO STANDARD OIL FIELD BIT



FINEST QUALITY DRILL BORTZ

"Sell it and make your fortune Mynheer Van Niekirk"

It was the year 1876. Free America was 100 years old and there were great celebrations in Philadelphia. In London, Queen Victoria was proclaimed Empress of India.

In South Africa, children playing by the Orange River found a bright pebble, too pretty to throw away, but when trader Van Niekirk offered to buy it they shouted with laughter and told him to sell it and make his fortune.

But, nobody wanted to buy the pebble so Van Niekirk dropped it in an envelope and mailed it to a government agent who declared it to be a diamond of 21 carats. Then, the governor of the Colony bought it for five hundred pounds and sent it to the Paris Exhibition as a curiosity.

Nobody paid much attention, but this was the first clue to the existence of the diamond fields that would one day pour out fabulous treasures in gems—and in industrial diamonds, those incomparable cutting points which are the vital time-saving, cost-reducing element in Truco Diamond Bits.

With Truco Diamond Bits you get irresistible cutting power in any formation; swift, accurate penetration that reduces rig time and pays off handsomely in cash savings. May we send you our Truco Diamond Bit Catalog?

TRUCO DIAMOND BITS

by

WHEEL TRUEING TOOL COMPANY

3200 W. Davison Avenue, Detroit 38, Michigan

WHEEL TRUEING TOOL CO. OF CANADA, LTD.
575 Langlois Avenue, Windsor, Ont., Canada

B.F.Goodrich

Tires carry 40 tons of coal over 25,000 miles of rocks—ready for more

ONE of the world's largest strip mines is operated by the United Electric Coal Companies at DuQuoin, Illinois. Here fleets of trucks carry 40-ton loads of coal from rock-strewn pits over long haul roads made of abrasive slate. Tires could be chewed to pieces quickly, running up huge maintenance costs, running down production.

United avoids these problems with B. F Goodrich tires, reports they have averaged 25,000 miles already with less than half their service life gone!

All-Nylon cord body

Universal tires can take this kind of punishment because they're now built with an *all-nylon* cord body (size 12.00 and larger, smaller sizes in rayon or nylon). Nylon is stronger than ordinary cord materials, can withstand double the impact and resist flex breaks.

Under the tread is the patented B. F. Goodrich nylon shock shield. Layers of strong nylon cords stretch together to absorb shocks and protect the tire body Universal tires wear longer; more tires can be recapped. You pay nothing extra for this nylon shock shield.

See your B. F. Goodrich representative today and find out how you can get longer tire service at lower cost in your mine work. The address is listed under Tires in the Yellow Pages of your phone book. Or write *The B. F. Goodrich Company, Tire & Equipment Division, Akron 18, Ohio.*

Specify B. F. Goodrich tires when ordering new equipment

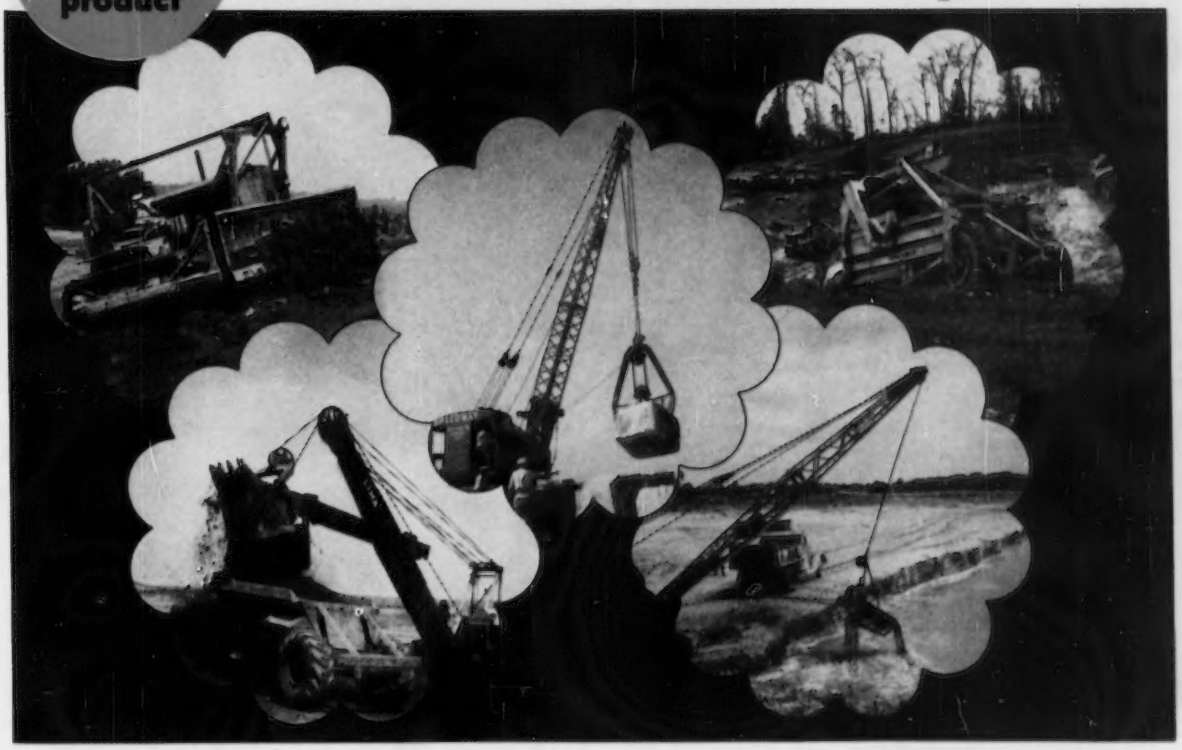
UNIVERSAL TREAD resists rock cuts and bruises. Wedge-shaped cleats defy slippage, pull in either direction.

OVER-ALL VIEW of the giant DuQuoin mine. It's one of 6 operated by United in Illinois and Kentucky

DRILL BORTZ

an ACCO product

American Cable "Tru-Lay" "Green Strand" Wire Rope



If you operate any of these machines, this information may save you money on your wire rope purchases...

• Every machine you use wire rope on has characteristics which must be considered in choosing the rope which will give you the longest service. For instance, the bulldozer and carrier scraper have extremely small sheaves which bend the rope sharply and small drums which cause very severe abrasive and crushing actions on the rope. So the best rope is "Streamlined" Flattened-Strand.

Regular crane service is usually not too hard on rope but sometimes the sheaves are rather small and there is a great deal of whipping and frequently twisting to contend with.

Shovels have big sheaves but are subjected to shock loads and jerks which can yank a rope in two. Draglines also offer a real challenge. Usually they have smaller sheaves. The rope drags in the dirt and it gets one bad shock after another.

For every one of these machines there is one particular Tru-Lay Preformed "Green Strand" wire rope construction and grade which will give better service and save you money. The problems have always been to decide on which construction you need—and where to get it. American Cable has eliminated these problems by setting down correct recommendations of what ropes will cost you least to use, and by making them available at your nearby American Cable distributor.

Get a copy of this FREE book!

"Wire Rope Recommendations for General Contractors," contains recommendations of the correct ropes for every machine you operate. Photographs and alphabetical listings make it easy to use. There is also some interesting information on ACCO Registered DUALOC Boom Cable Assemblies.

See your American Cable distributor today or write our Wilkes-Barre, Pa., office for a free copy of this useful, money-saving booklet.

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plus ACCO Registered Wire Rope Slings

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Producing at a Profit

with Traylor TY Reduction Crushers

No matter where you are mining . . . chances are you'll find a Traylor TY Crusher not far off. It will be one of the 826 Traylor TY Crushers operating efficiently all over the world. Here's first-hand proof that a TY secondary crusher combines high production, economy of operation and low maintenance cost in one rugged, compact unit. Traylor offers six sizes to choose from . . . can provide a TY crusher that's "Traylor-Made" to produce at a profit on your specific operation. Get the facts . . . send for your copy of Bulletin 7112.

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712 Mill St., Allentown, Pa.
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A Traylor leads to greater profits

SEND FOR BULLETINS
. . . just mention the Traylor Equipment that interests you.

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MUSCLES OF STEEL

put the mules out of business

Oldtimers in coal mining can remember when mule-power was the only means of transportation in the mines.

Today's efficient coal mining demands big-capacity mechanized equipment. In modern underground mines, wire rope serves as *muscles of steel*—pulling cars from the loader to discharge point. In strip mining, also, wire rope provides the *muscle* for huge stripping shovels.

No matter what the job may be—wherever there's need for *muscles of steel*—it's a safe bet that Wickwire Rope is busy at work. In the mines and the quarries. In the logging camps and the oil fields. With the fishing fleets and in materials handling. In all of these fields, Wickwire Rope has a record of economical and dependable performance that can't be beat.

every industry benefits from wire rope

WICKWIRE ROPE

CF&I PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

2695

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Carry the load via Link-Belt belt conveyors... SEE YOUR COSTS GO DOWN

LINK-BELT offers you the "total engineering" so necessary for top efficiency

DESIGNED FOR OVERALL EFFICIENCY

Because of its unrivalled experience, Link-Belt can do a better job of gathering and analyzing all data. Proposals reflect this understanding of the most practical way to fit conveyors into your overall system requirements.

BUILT FOR LONG-LIFE PERFORMANCE

Link-Belt manufactures all components and related feeders and conveyors. You are assured of the right equipment because of this breadth of line. And Link-Belt will supply the highest grade belts engineered to the job.

DELIVERS FULL RATED CAPACITY

Link-Belt follows through on every detail of the job, including electrical controls and even wiring and foundations. What's more, Link-Belt will furnish experienced erection superintendents, staffs and skilled crews if desired.

ASSURE SATISFACTORY PERFORMANCE

When you rely on Link-Belt as a single source for your complete system, Link-Belt accepts responsibility for placing it in full operating readiness. We will also supervise modernization of existing systems.

This extensive belt conveyor system is another example of Link-Belt's preparedness to solve bulk handling problems, either large or small.

WHETHER it's a single belt conveyor or a complete system, there's no substitute for Link-Belt equipment and Link-Belt engineering. Call the district sales office near you for all the facts on this unique single-contract service.

LINK-BELT

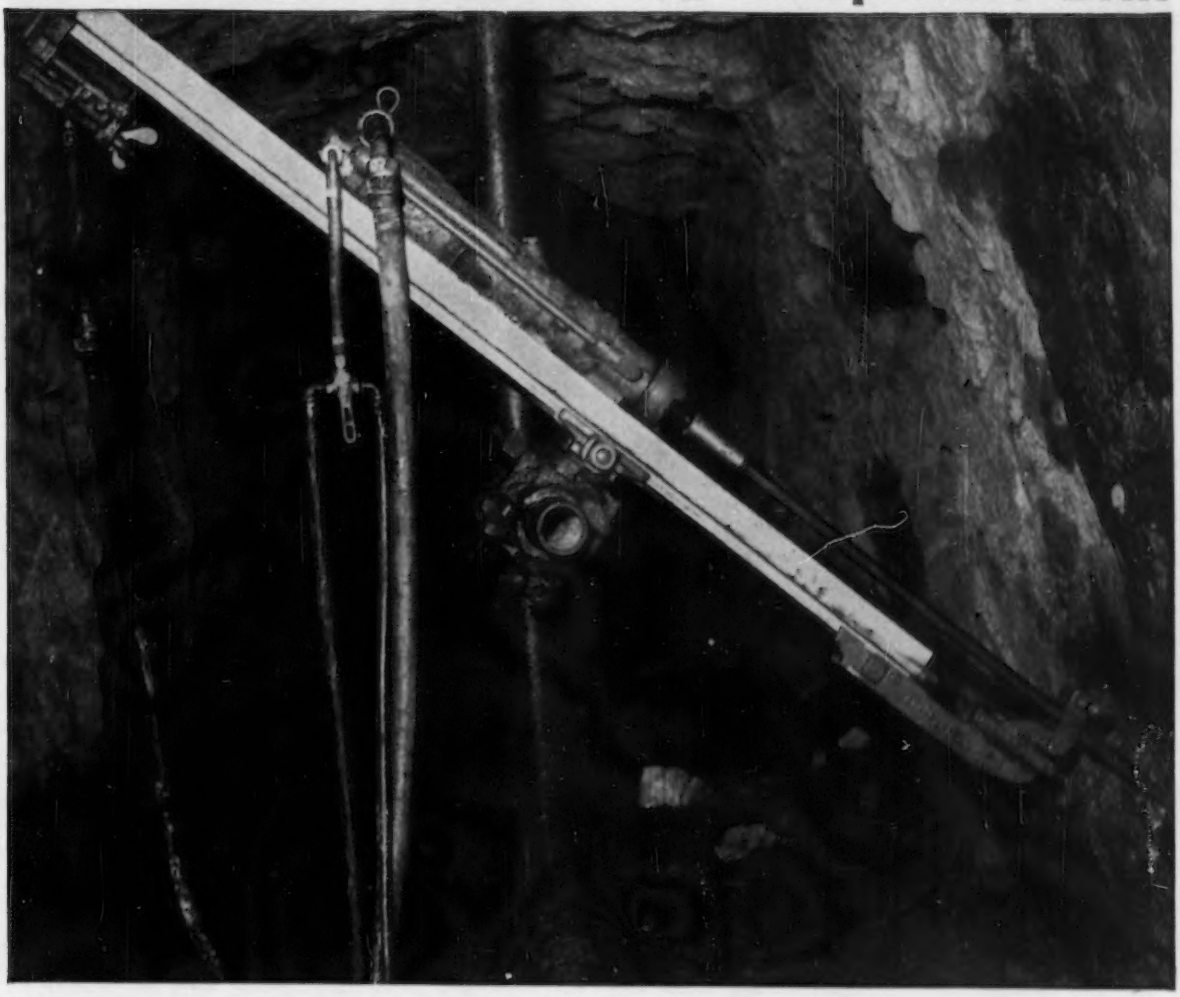
BELT CONVEYOR EQUIPMENT

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

13,467-B

First in the field!

New Gardner-Denver 4½" Deep Hole Drill



new 4½" hammer diameter for heavy-duty underground drilling.

new drilling power for deeper long hole drilling.

new drilling capacity for handling larger diameter bits.

Big brother to the popular Gardner-Denver SFH99 Deep Hole Drill, the new 4½" SFH123 has been engineered for use with Ring Seal Shank and Sectional Drill Rods. Compact screw feed guide shell handles steel changes up to 5'. Write us today for additional specifications.

The new Gardner-Denver **SFH123** 4½" Deep Hole Drill

SINCE 1859

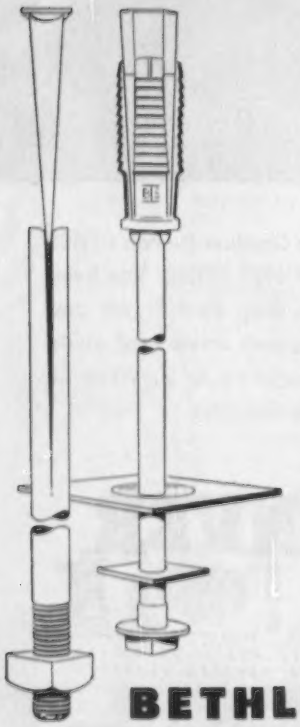
GARDNER-DENVER

THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada) Ltd., 14 Curity Avenue, Toronto 16, Ontario

Roof Bolting Makes a Better Mine



You make any mine better, safer, more productive, when you put in roof bolts to replace old-fashioned roof supports. This is because roof bolts consolidate strata into a single-unit thick beam.

Besides promoting safety, roof bolts also help to increase production, because they make possible wider openings and clearances, and increased room in which to operate mechanized equipment. And because of the absence of space-consuming supports, ventilation is improved.

Described here are four Bethlehem roof bolts, any one of which will help you obtain these safer operating conditions.

SQUARE-HEAD BOLTS

Made in three types: (1) a ¾ in. carbon-type bolt having minimum breaking load of 20,000 lb; (2) a ⅝ in. high-strength bolt, having same breaking load, and (3) a ⅞ in. high-strength bolt with minimum breaking load of 40,000 lb. The ⅞ in. bolt is intended for use with Bethlehem's matching-halves Type F expansion shell. The ¾ in. and ⅝ in. bolts may be used either with the Type F shell or the 4-leaf Type C shell.

For use with headed bolts, Bethlehem also makes a hardened washer. It reduces the friction between the bolt head and the roof plate that occurs when high tension in the bolt produces excessive bearing pressure. The washer permits the free use of impact wrenches, without galling or tearing of metal.

SLOTTED BOLT

A 1-in. bolt, with a centered, forged slot. No metal is removed in slotting. Opposite end of bolt has 5 in. of rolled threads. Bolt is for use with steel wedge, in 1¼ in. hole. When bolt is driven, wedge is forced into slot, expanding bolt-end. Truncated-cone point prevents thread damage. Usually comes with American Standard regular square nut.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM MINE ROOF BOLTS

BETHLEHEM STEEL

INTRODUCING THE

INTERNATIONAL DROTT 4-in-1 Skid Shovel

BULLDOZER—The bullclam is wide open and the rear of the bucket becomes the dozer. Depth of cut is regulated by forward and backward pitch of the blade.

BULLCLAM—By opening the clam 10 inches the cutting edge is lowered 2 inches. As the unit moves forward material boils into the bullclam.

SKID-SHOVEL—With clam closed, straight-forward loading of the shovel is accomplished by rolling the whole bucket forward to excavate. When filled it is rolled back over the Skid-Shoes to retain heaped load.

CLAMSHELL—Opening bullclam wide makes it possible to operate as a clamshell. Clam is brought down into material and closed by hydraulic pressure.

Hydraulic Selector Lever Converts Latest Addition to INTERNATIONAL DROTT line into a...

❶ BULLDOZER ❷ BULLCLAM

❸ SKID-SHOVEL ❹ CLAMSHELL

Here's the unit that answers every requirement for a single machine capable of handling a wide variety of jobs.

It's the NEW 4-in-1 multipurpose addition to the famed INTERNATIONAL DROTT Skid-Shovel line and it's available on INTERNATIONAL TD-6 and TD-9 crawlers.

The 4-in-1 can immediately be changed into a Bulldozer, Bullclam, Skid-Shovel or Clamshell by merely shifting the "shovel-selector" lever into the desired position. The lever is at the operator's finger tips, and shovel selection can be made whether the tractor is in motion or standing still. For fast loading of any material, the 4-in-1 can be operated either as a forward dump or bottom dump shovel.

Like all products in the INTERNATIONAL DROTT line, the new 4-in-1 reduces wear and strain on the tractor by transporting heaped loads on the exclusive Skid-Shoes. These same Skid-Shoes provide 300% greater break-out force than on competing shovels. There's the exclusive "Hydro-Spring" feature, too, that absorbs 70% of the shock normally encountered in front-end loaders for increased operator comfort and longer tractor life.

On specific earthmoving work such as excavating or loading the standard INTERNATIONAL DROTT Skid-Shovel is tops. But if you're looking for one machine to handle many jobs, the 4-in-1 is it.

For a demonstration, call your INTERNATIONAL Industrial Distributor today.

DROTT MANUFACTURING CORP., MILWAUKEE 8, WISCONSIN
INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILLINOIS

FREE—NEW 4-IN-1 CATALOG

INTERNATIONAL® DROTT

Drott Mfg. Corp.,
3841 W. Wisconsin Ave.,
Milwaukee 8, Wisconsin

Gentlemen:
Please send the new 4-in-1 catalog to:

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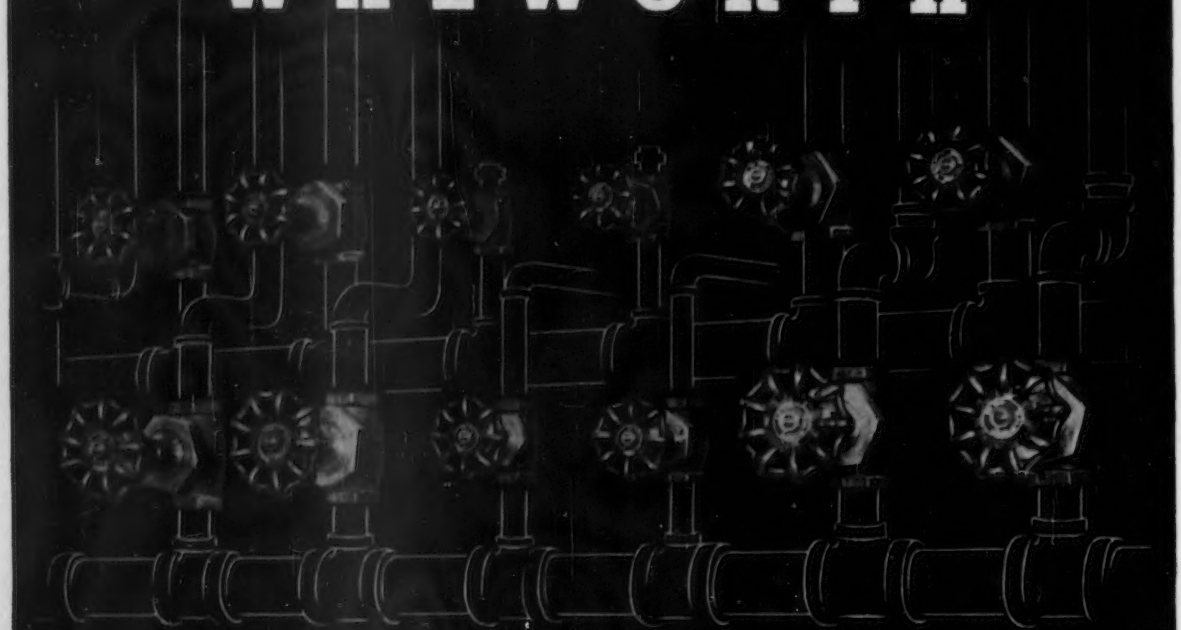
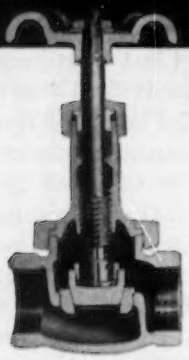
WALWORTH



BRONZE VALVES

Better because ... **Walworth has standardized its line of bronze valves to provide an unsurpassed system of interchangeability of parts for assembly or replacement. You can maintain a great number of Walworth Bronze Valves with a small inventory of basic parts . . . you minimize part replacement problems. For further information, ask us for our Bronze Valve Standardization Chart.**



Parts are carefully machined and finished to close tolerances, thereby assuring accurate fit and alignment under all conditions. Sectioned valve is Walworth No. 225P *Bronze* Globe Valve with stainless steel plug-type seat and disc, heat-treated to a minimum of 500 Brinell hardness.

Choose from complete lines of Walworth Bronze Valves – including gate, globe, angle, check, and lubricated plug types. Walseal® Bronze Valves and Fittings are also available for making silver-brazed joints.

For full information on Walworth Bronze Valves and Fittings, call your Walworth Distributor, nearest Walworth Sales Office, or write to Walworth Company, General Offices, 60 East 42nd Street, New York 17, N. Y.

WALWORTH

Manufacturers since 1842

valves . . . pipe fittings . . . pipe wrenches

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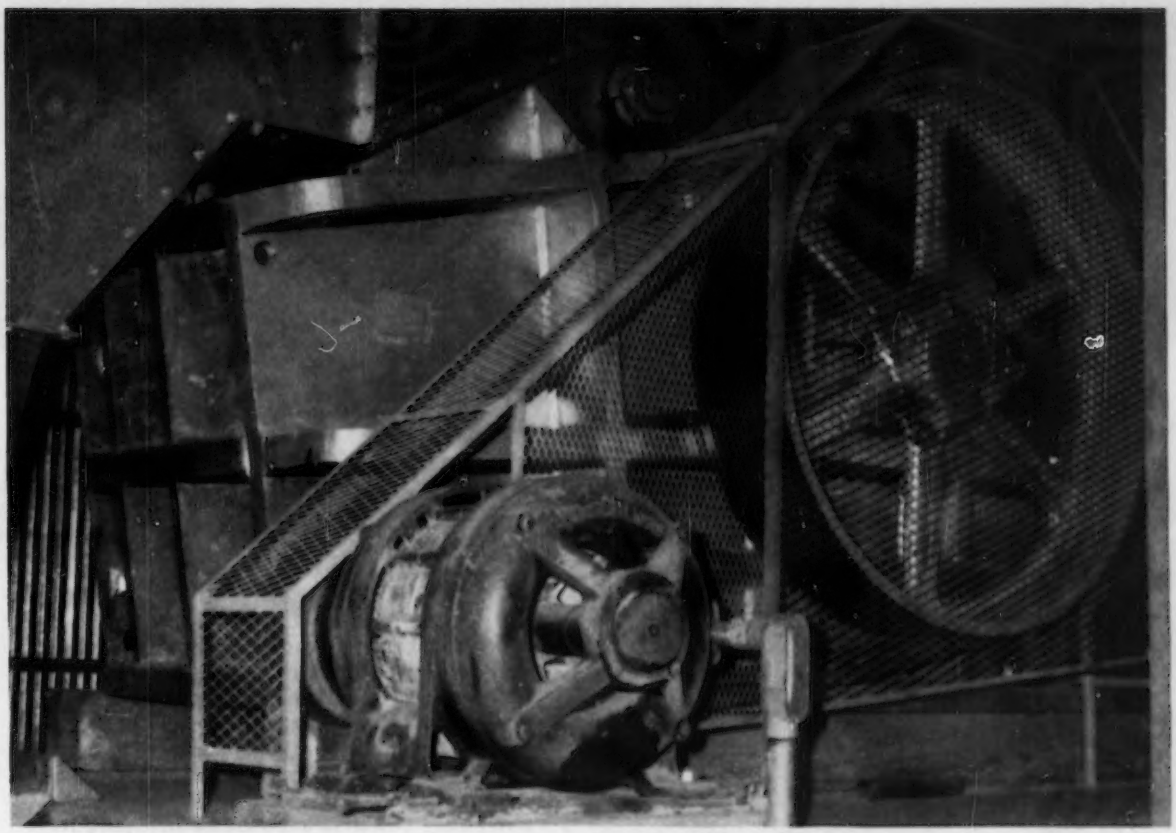

TRAYLOR TYPE "H" JAW CRUSHERS

Strike a Crushing Blow

AT MINING PRODUCTION COSTS

A Type H Jaw Crusher, with Traylor original Curved Jaw Plates, is a most powerful weapon in your private war against rising production costs. Users report that Traylor Curved Jaw Plates outlast conventional straight plates 3 to1. In hard service gradual wear is distributed evenly over the entire curved surfaces of the plates. Their original shape . . . and efficiency . . . lasts indefinitely. In addition, Traylor Curved Jaw Plates produce far greater capacities . . . even at finer settings. Each succeeding zone in the crushing chamber is of greater capacity, so choking and packing are practically eliminated.

Get the facts . . . send for your free copy of Bulletin 8120 which outlines full specifications on the complete line of Traylor Jaw Crushers.

10 sizes with Capacities from 4 to 300 tons per hour; feed openings from 8″ x 12″ to 30″ x 42″.

TRAYLOR ENGINEERING & MFG. CO.
702 Mill St., Allentown, Pa.
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2 Stock Answers for

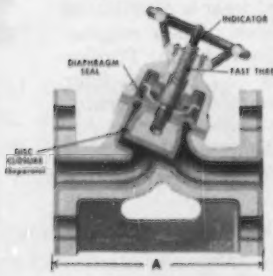
Farris X-V Series

This versatile, dependable, economically-priced hand valve is equally at home in corrosion, abrasion, vacuum or general service—wherever positive action is needed. The X-V Series disc—for positive closure—and diaphragm—for positive sealing—work independently, with only the disc exposed to pressure in the closed position, substantially increasing diaphragm life, lowering torque and providing unsurpassed vacuum service . . . No other valve does such a complete job at so little cost!

Write for Bulletin FL-154

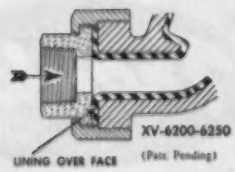
DISC for positive closure

DIAPHRAGM for positive sealing



NEW

Corrosion Resistant Union Ends

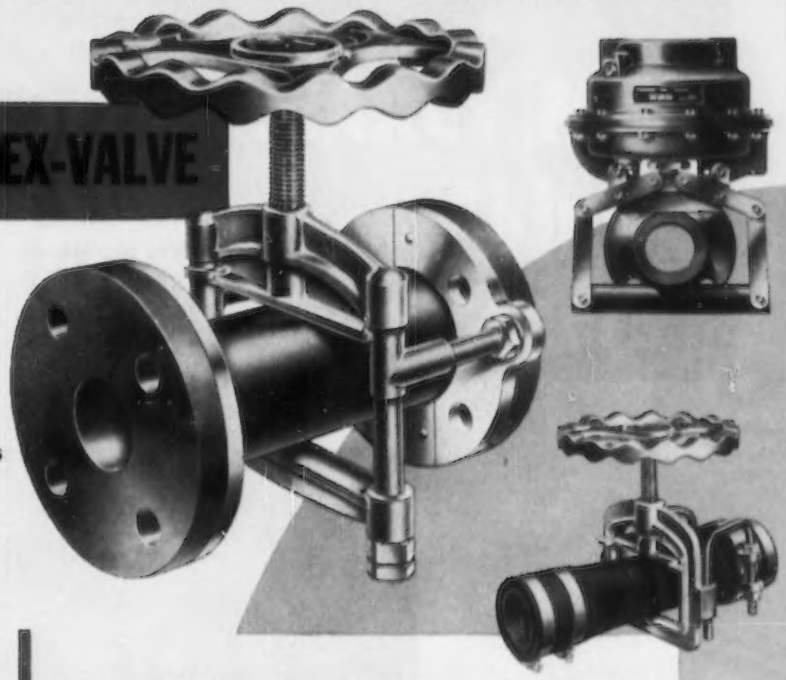


X-V Series Design Features

- Realistically-Priced for Low-Cost Service
- 50% Greater Capacity than Similar Type Valves
- Only Disc Area Exposed to High Vacuum in Closed Position
- No Packing Gland to Leak. Mechanism Not Exposed
- Low Hand-Wheel Torque... Easy to Operate
- Available in Lined or Unlined Models...With Corrosion Resistant Union Ends.

Tough Valve Problems

Farris Pinch-type FLEX-VALVE



No other valve controls the flow of hard-to-handle corrosive and abrasive materials with the efficiency and reliability of the Farris Pinch-Type FLEX-VALVE . . . because FLEX-VALVE cannot plug! This is the simplest valve made—only two components—employing the fundamental principle of pinching off the rugged, flexible valve body. Case histories show batteries of these valves in severe service for more than 20 years—and still going strong!

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YOUR MONEY BACK

IF IT PLUGS!

Flex-Valve's Exclusive Advantages

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- Maintenance Free
- Bubble Air-Tight
- Low Replacement Cost
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- Air or Hand-operated Types

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There is no compromise with experience!
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A DEEP HOLE SET-UP...

IN CLOSE QUARTERS

Here, combined in one compact machine, is a powerful rotary drill, with an entirely independent motor feed, that can be quickly set up in restricted areas. And that's not all! With the CP-555 Rotauger you can double your drilling speed in gypsum, talc, medium limestone and other relatively soft formations — two to six feet per minute in depths to one hundred feet. For more information, write for Bulletin SP-3110. *Chicago Pneumatic Tool Company, 8 East 44th St., New York 17, N. Y.*

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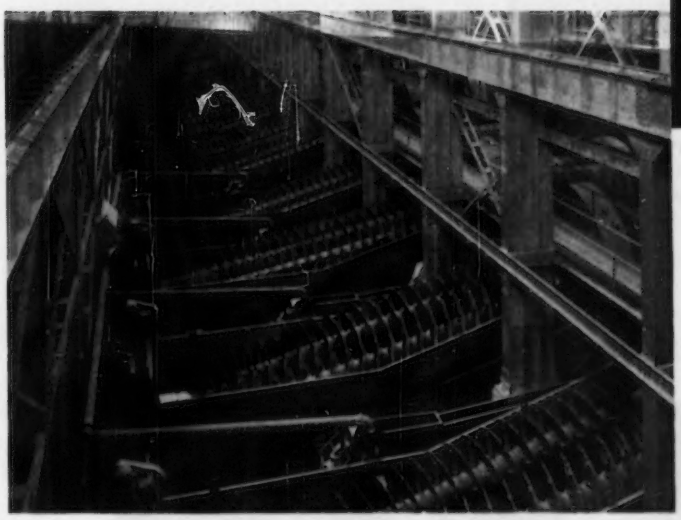
copper company again selects this cost-cutting team of MARCY Mills and Akins Classifiers



HAS USED TOTAL OF 114 MARCYS AND 116 AKINS

This leading copper company bought its first Marcy Mill in 1918 and its first Akins Classifier in 1925. Based upon the successful performance of this equipment they have continued ordering Marcys and Akins for their many plants... have used a total of 114 Marcy Mills and 116 Akins Classifiers. The new mill shown above includes 8, 10′ x 10′ Marcy Ball Mills and 20, 54″ Duplex Akins Classifiers.

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- Individual engineering on every application
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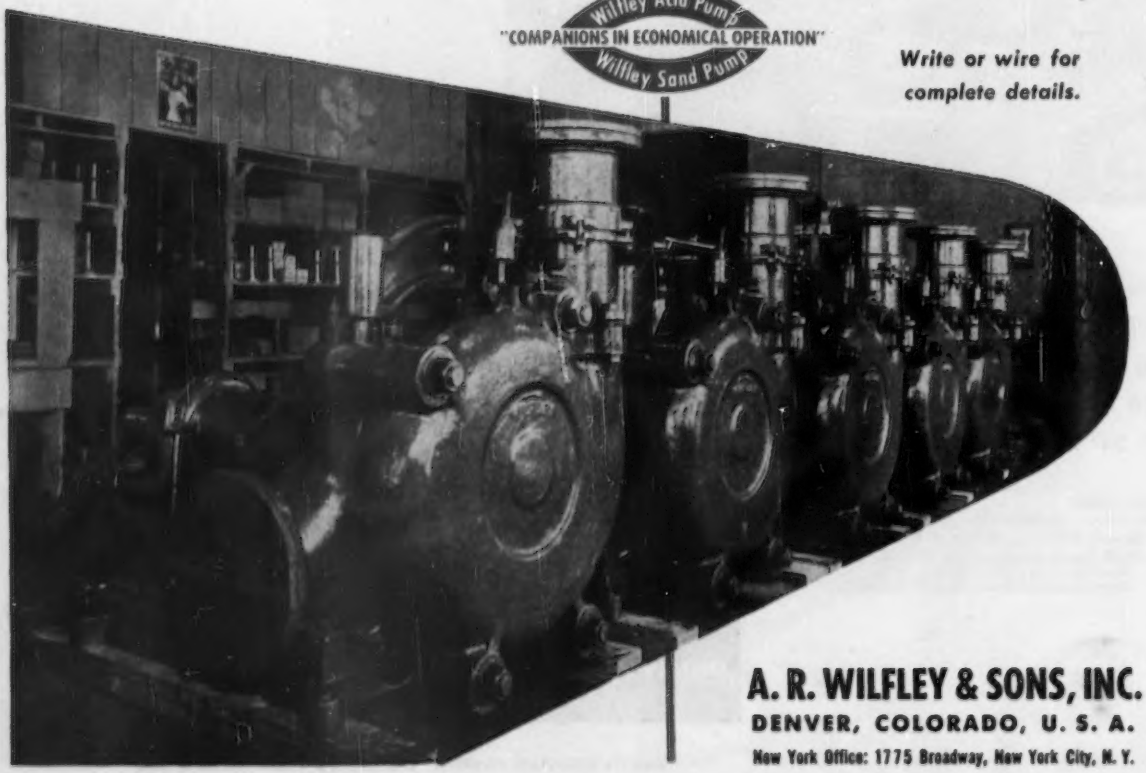
Wilfley Acid Pump
"COMPANIONS IN ECONOMICAL OPERATION"
Wilfley Sand Pump

Write or wire for complete details.



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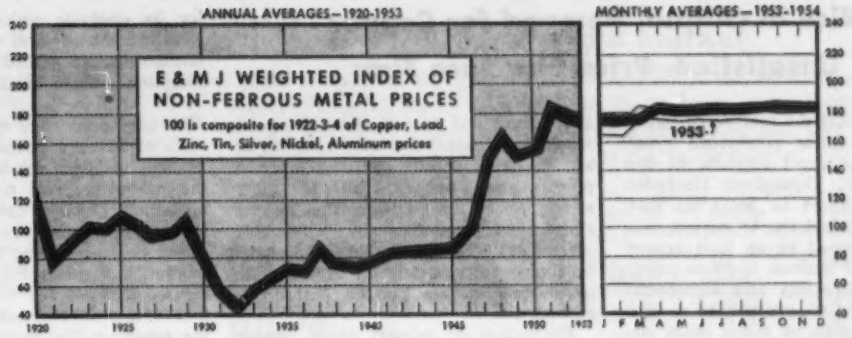
E&MJ OUTLOOK

PRICES


ANNUAL AVERAGES—1920-1953
E & M J WEIGHTED INDEX OF NON-FERROUS METAL PRICES
100 is composite for 1922-3-4 of Copper, Lead, Zinc, Tin, Silver, Nickel, Aluminum prices
MONTHLY AVERAGES—1953-1954
1953
1954
J F M A M J J A S O N D

MARKETS

Reversing the trend of a year ago, non-ferrous metals ended 1954 on a firm note (with tin the only off-key member). The E&MJ index of non-ferrous metal prices held fast at 187.45 for December against 187.44 for November. It was 180.-66 for December a year ago. Lower tin averages last month balanced a higher average for nickel.

Copper demands run heavy, with consumers worried by threats of strikes in Rhodesia and unsettlement in Chile. Production increases steadily, however, and the supply outlook (long-term) is favorable.

Lead and zinc are well in hand, provided government stockpiling continues. It's safe for the first half of 1955, and no one believes Washington will drop stockpiling or other industry aid in July.

●

AT HOME

The prospect's good for 1955 in industries important to mining. Demand for most metals and minerals should be strong and steady. Here's how the year seems to shape up for the economy as a whole:

1. **Industrial activity**—up on the FRB index from 1954's mark of 125 to about 130 for 1955.

2. **Consumer income**—up to $292-billion from 1954's $287-billion. It's likely, too, that consumer spending will be higher than in 1954.

3. **Industrial investment**—off slightly, but balanced by inventory rebuilding.

4. **Government spending**—lower Federal, but higher local and state.

New entry in uranium exploration race is combination of New Jersey Zinc and Texaco, which will operate in Western U.S.

Three pelletizing techniques for taconite concentrates are now on the boards, with: Erie's shaft-type furnace; Reserve's down-draft travelling grate; Cleveland Cliff's multi-layer up-draft travelling grate. It's about the most interesting technical development to watch we know of.

●

ABROAD

Mexican sulphur production (See p. 72) aims at a million tons yearly, most of it for export. That approaches current U.S. sulphur export, but there's room for expansion in the export market, after all.

●

LABOR

Mine, Mill isn't driving openly yet to organize uranium miners in the Colorado Plateau, but it's a cinch they'd like to. The Plateau's too-small, too-scattered units, plus the Communist stigma, make it tough for Mine, Mill's organizers to do much, except perhaps to infiltrate—and wait.

MARKETS—Trends and Prices

Despite Rise in Output, Demand for Copper Remains Unsatisfied—Price Structure Firm

AS 1954 ENDED the attitude of buyers in respect to major nonferrous metals was almost the exact opposite of that of a year ago. Throughout December they were disposed to build up their inventories, particularly in copper, and all looked forward to at least several months of good business and firm prices. With the construction and automobile industries likely to operate at a high rate for some time to come, many observers thought that the outlook was highly favorable for the entire first half of the new year.

Prices were steady at the turn of the year. Tin averages were lower, an unexpected development, but nickel was up for the month. Domestic copper, lead, zinc, and aluminum were unchanged. The *E&MJ* index of nonferrous metal prices for December was about unchanged at 187.45, against 187.44 in the preceding month. In December 1953 the index stood at 180.66. The base period for the index is 1922-3-4. Considering the fall in the purchasing power of the dollar, the rise in metal prices in recent years can be viewed as a natural trend.

Copper was active, with consumers here and abroad interested in obtaining long-term contracts on an average price basis to obtain an assured supply of the metal. Covering by speculators in London resulted in a rather wide spread between the cash and forward position. Proposals for introducing a measure of price stability for Commonwealth copper were discussed in London. According to F. C. Chisnell, an official of Anglo Metal Co., agent of Rhodesian Selection Trust, "the suggestions have been thrown out as an attempt to try and iron out some of the fluctuations in the price of the metal. Greater price stability would enable consumers to say that the price would be constant for, say, a month or six weeks." Growing competition from plastics and aluminum calls for more stable prices for copper, the experts claim. The comparatively stable U.S. market has been cited by those who have become concerned over the erratic price movements on the London Metal Exchange.

Production of primary crude copper in the U.S. in November was estimated by Copper Institute at 91,094 tons, which compares with 68,479 tons in October and 61,827 tons in September. Producers are fast recovering some of the ground lost in the period of labor strife that began last August. Production of primary crude outside of the U.S. in November totaled 133,420 tons, against 138,487 tons in October and 125,158 tons in September. Chile's production has increased to more than 34,000 tons a month. Increased mine output should be reflected in a larger available supply of refined metal for 1955.

U.S. fabricators obtained 118,925 tons of refined copper during November, against 105,293 tons in October and 89,198 tons in September. Metal released from Government stocks helped out considerably in raising the tonnages available during October and November. The available supply of copper for the U.S. market for 1955 is expected to increase by around 9,000 tons a month, excluding scrap.

Lead consumption has improved and some good buying came into the market during the last month. Though consumers thought the price was on the high side, they absorbed metal of domestic and foreign origin to hold inventories to what might be regarded as a normal level. The Government was in the market for lead for its stockpile which kept the price structure on a firm basis. A steady foreign market pointed to sustained consumption outside of the U.S.

Zinc quotations were maintained on the basis of 11½c a pound, East St. Louis. Those who hoped for a 12c basis before the end of the year naturally were disappointed. Despite continued buying for the stockpile, the price could not be raised because of the uncertain foreign market. U.S. production of slab zinc increased from 67,047 tons in October to 80,119 tons in November, according to the American Zinc Institute. The rise followed settlement of strikes that closed down facilities in Montana and elsewhere.

Tin met with a setback pricewise on "switching operations" in sterling exchange. Production has been in excess of requirements, which made it possible to undercut regular dealers where cheap sterling entered into the picture. Another market factor was the continued uncertainty as to date on which the Interna-

Yearly Average Prices—1950-1954

(E. & M. J. Averages)

	1950	1951	1952	1953	1954
Copper, domestic, f.o.b. refinery	21.235	24.200	24.200	28.798	29.694
Copper, foreign, f.o.b. refinery	21.549	26.258	31.746	30.845	29.889
Lead, common, New York	13.296	17.500	16.467	13.489	14.054
Lead, common, St. Louis	13.096	17.300	16.266	13.288	13.854
Zinc, Prime Western, St. Louis	13.866	18.000	16.215	10.855	10.681
Tin, Straits, New York	95.539	127.077	120.473	95.845	91.838
Silver, foreign, New York	74.169	89.368	84.941	85.188	85.250
Quicksilver (per flask 76-lb.)	$81.258	$210.125	$199.097	$193.032	$264.386
Antimony, N. Y. (cases, l.c.l.)	30.906	45.666	45.524	37.402	31.970
Platinum, refined	$76.556	$90.000	$90.000	$91.238	$83.897
Cadmium (producers' quotation)	216.840	255.000	224.095	199.439	172.500
Aluminum, 99 plus percent, ingot	17.713	19.000	19.410	20.931	21.784
Magnesium, ingot	22.043	24.500	24.500	26.535	27.000
Nickel, electrolytic	44.792	54.000	56.500	59.888	60.453

Average Prices for December (E&MJ Quotations)

Copper:	
Electrolytic, domestic, refinery	29.700
Electrolytic, export, refinery	31.036
Lead:	
Common, New York	15.000
Common, St. Louis	14.800
Silver and sterling exchange:	
Silver, New York, per oz.	85.250
Silver, London, pence per oz.	74.250
Sterling Exchange, "Checks"	278.764
Zinc:	
Prime Western, East St. Louis	11.500
Prime Western, delivered (g)	12.000
Tin:	
New York Straits	88.649
New York, 99% min. (e)	87.649
Gold, per oz. U.S. price	$35.000
Quicksilver, per flask	$319.538
Antimony (E&MJ) (d)	31.970
Antimony, bulk, Laredo	28.500
Antimony, in cases, Laredo	29.000
Platinum refined, per oz.	$78.250
Cadmium (a)	170.000
Cadmium (b)	170.000
Cadmium (c)	170.000
Aluminum, 99% plus ingot	22.200
Magnesium, ingot	27.000
Nickel (f)	64.500

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lb.
(a) Cadmium average based on the producers' quotations.
(b) Cadmium average based on the average of the producers' and platers' quotation.
(c) Cadmium average based on platers' quotation.
(d) Domestic, 5 tons or more but less than carload lots, packed in case f.o.b. New York.
(e) Tin content.
(f) F.o.b. Port Colborne, U.S. duty included.
(g) Delivered where freight exceeds 0.5c.

Markets Continued on Page 112

tional Tin Agreement will come into full bloom. Great Britain ratified the control plan on Dec. 15 in behalf of herself, Malaya, and Nigeria. This brings into the agreement 418 producer country votes and 145 consumer country votes. Minimum votes required to bring the plan into operation is 900 for the producers and 333 for the consumers.

Quicksilver steadied toward the end of the year on news from Mexico that shippers will be required to obtain export licenses.

Platinum was unsettled, but steady before the end of the month on reduced offerings from outside sources.

"Free" Gold Market

Gold transactions during December reached about the same volume as in November. Price movements were irregular. Demand was active in the Near East, the Far East, and South America. There were no Russian gold sales. Pick's World Currency Report quotes on "free" gold, per fine oz, as follows:

	COINS		BARS (12.5 kg)	
	Nov. 30	Dec. 30	Nov. 30	Dec. 30
NEW YORK, transit	.....	.....	$35.10	$35.10
MANILA	$40.75	$40.50	38.00	37.80
HONG KONG	40.25	40.00	37.75	37.85
BOMBAY	48.50	49.00	47.50	48.65
TANGIER	40.45	38.75	35.05	35.00
BEYROUTH	41.15	39.90	35.25	35.18
PARIS	39.95	38.40	35.60	35.50
BUENOS AIRES	41.35	40.95	39.00	39.50

Note: All prices are computed at the free or black market value of the U. S. dollar in the local markets

Major Metals

U. S. DAILY AND AVERAGE PRICES

Dec. 1954	Electrolytic Copper (a) Domestic	(b) Export	Straits Tin New York	Lead New York	Lead St. Louis	Zinc (f) Delivered	Zinc East St. Louis
1	29.700	30.175	90.250	15.000	14.800	12.000	11.500
2	29.700	30.575	90.250	15.000	14.800	12.000	11.500
3	29.700	30.200	90.000	15.000	14.800	12.000	11.500
4	No Market	30.600	90.000	15.000	14.800	12.000	11.500
6	29.700	30.700	89.875	15.000	14.800	12.000	11.500
7	29.700	30.925	89.875	15.000	14.800	12.000	11.500
8	29.700	30.475	90.000	15.000	14.800	12.000	11.500
9	29.700	31.625	90.000	15.000	14.800	12.000	11.500
10	29.700	30.600	89.875	15.000	14.800	12.000	11.500
11	No Market	30.600	89.875	15.000	14.800	12.000	11.500
13	29.700	30.700	89.500	15.000	14.800	12.000	11.500
14	29.700	31.125	89.375	15.000	14.800	12.000	11.500
15	29.700	31.050	89.250	15.000	14.800	12.000	11.500
16	29.700	32.375	89.000	15.000	14.800	12.000	11.500
17	29.700	31.300	88.000	15.000	14.800	12.000	11.500
18	No Market	31.875	88.000	15.000	14.800	12.000	11.500
20	29.700	30.625	87.500	15.000	14.800	12.000	11.500
21	29.700	31.425	85.625	15.000	14.800	12.000	11.500
22	29.700	31.750	86.500	15.000	14.800	12.000	11.500
23	29.700	31.325	87.250	15.000	14.800	12.000	11.500
24	29.700	30.575	87.250	15.000	14.800	12.000	11.500
25	Holiday	Holiday	Holiday	Holiday	Holiday	Holiday	Holiday
27	29.700	30.625	87.250	15.000	14.800	12.000	11.500
28	29.700	31.250	87.125	15.000	14.800	12.000	11.500
29	29.700	31.050	87.500	15.000	14.800	12.000	11.500
30	29.700	31.650	87.750	15.000	14.800	12.000	11.500
31	29.700	31.750	88.000	15.000	14.800	12.000	11.500
AVERAGES FOR MONTH							
Dec.	29.700	31.036	88.649	15.000	14.800	12.000	11.500
AVERAGES FOR WEEK							
Dec.							
1	29.700	31.042	90.525	15.000	14.800	12.000	11.500
8	29.700	30.579	90.000	15.000	14.800	12.000	11.500
15	29.700	30.950	89.646	15.000	14.800	12.000	11.500
22	29.700	31.558	87.438	15.000	14.800	12.000	11.500
29	29.700	30.965	87.275	15.000	14.800	12.000	11.500
CALENDAR WEEK AVERAGES							
Dec.							
4	29.700	30.546	90.229	15.000	14.800	12.000	11.500
11	29.700	30.821	89.917	15.000	14.800	12.000	11.500
18	29.700	31.404	88.854	15.000	14.800	12.000	11.500
25	29.700	31.140	86.825	15.000	14.800	12.000	11.500

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

Dec. 1954	Sterling Exchange "Checks"	Silver (c) New York	Silver London	Gold London	Gold (d) United States
1	278.6875	85.250	74.250d.	251s. 7¼ d.	$35.00
2	278.5000	85.250	74.250d.	251s. 7½d.	35.00
3	278.6875	85.250	74.250d.	251s. 5 d.	35.00
4	(e)	(e)	(e)	(e)	35.00
6	278.8750	85.250	74.250d.	251s. 3½d.	35.00
7	279.0000	85.250	74.250d.	251s. 1½d.	35.00
8	279.1250	85.250	74.250d.	251s. ½d.	35.00
9	278.9375	85.250	74.250d.	251s. 1d.	35.00
10	278.8750	85.250	74.250d.	251s. 3d.	35.00
11	(e)	(e)	(e)	(e)	35.00
13	279.0625	85.250	74.250d.	251s. 3d.	35.00
14	278.9375	85.250	74.250d.	251s. 3d.	35.00
15	278.7500	85.250	74.250d.	251s. 4d.	35.00
16	278.7500	85.250	74.250d.	251s. 5½d.	35.00
17	278.6250	85.250	74.250d.	251s. 6d.	35.00
18	(e)	(e)	(e)	(e)	35.00
20	278.7500	85.250	74.250d.	251s. 5½d.	35.00
21	278.8750	85.250	74.250d.	251s. 4d.	35.00
22	278.7500	85.250	74.250d.	251s. 4d.	35.00
23	278.6250	85.250	74.250d.	251s. 5½d.	35.00
24	278.6250	Not quoted	74.250d.	251s. 7½d.	35.00
25	Holiday	Holiday	Holiday	Holiday	Holiday
27	278.6875	85.250	Holiday	Holiday	35.00
28	278.6875	85.250	74.250d.	251s. 6d.	35.00
29	278.6875	85.250	74.250d.	251s. 5½d.	35.00
30	278.5625	85.250	74.250d.	251s. 6d.	35.00
31	278.5000	Not quoted	74.250d.	251s. 6½d.	35.00
AVERAGES FOR MONTH					
Dec.	278.764	85.250	74.250d.	—	35.00
AVERAGES FOR WEEK					
Dec.					
1	278.734	85.250	—	—	—
8	278.838	85.250	—	—	—
15	278.913	85.250	—	—	—
22	278.750	85.250	—	—	—
29	278.663	85.250	—	—	—

Calendar Week Averages: New York Silver: Dec. 4th, 85.250; 11th, 85.250; 18th, 85.250; 25th, 85.250.
(e) No market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300c per pound, the average differential for delivery charges.

(b) Our export quotations for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingotbars; cathodes are sold at a discount of 0.125c to 0.15c per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East, Middle West, and West, effective Jan. 1, 1951, commanded a premium of 1.35c per pound over the current market for Prime Western; Special High Grade 1.50c.

(f) Prime Western delivered where freight from E. St. Louis exceeds one-half cent.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 points.

(c) The daily New York silver quotation reported by Handy & Harman is for silver contained in ores and other unrefined silver-bearing materials, in cents and fractions of a cent per troy ounce. It is determined by Handy & Harman on the basis of actual sales of bar silver .999 fine in amounts of 50,000 ounces or more for nearby delivery at New York, as reported daily by regular suppliers, and is usually one quarter-cent below the price paid for such bar silver, this deduction being the allowance to such suppliers for carrying, delivering and marketing. In addition to foreign silver, the quotations also apply to domestic silver if such silver enters into the New York market.

The Treasury's purchase price of newly mined domestic silver is 90.5 per troy ounce 1000 fine, effective July 1, 1946. London silver is pence per troy ounce, basis .999 fine.

(d) U.S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

Behind the By-Lines . . .

G. P. Lutjen

"What's with sulphur south of the border?" has been a question that has popped up on these premises with the regularity of a bill collector over the past two or three years. Preliminary reports issued from time to time, here and elsewhere, were perforce, largely speculative. Progress has now reached the point where we can present a factual report revealing exactly what is taking place in the Mexican sulphur industry.

"A New Empire of Frasch Process Sulphur Is Rising From the Jungles of Mexico," starting on p 72, is the work of News Editor **John Kearney** whose saga of Kitimat in the April 1954 issue earned him, locally at least, the title of "Canadian Jack." The sobriquet has now been changed to "Mexico Juan" in view of his really searching study of the sulphur situation in that country. His highly readable piece should answer all your questions on the subject.

Evidence that Swedish mining and metallurgical practices are among the best in the world has been piling up convincingly in recent years and on p 78, this issue of *E&MJ* weighs in with another exhibit. Metallurgists will be particularly interested to note how Boliden, at its Rönnskär Works, attains efficient production by operating large scale units, the largest they can obtain, at less than capacity. As a matter of fact, the revelation of Boliden's production philosophy makes interesting reading for anyone who has more than a dilletante's interest in the mining industry. We think you will join us in our congratulations to the author, **Mr. O. Herneryd,** for his excellent technical reporting.

Because the ink is always greener in somebody else's letter, especially if it's marked "Personal," we hereby present the opportunity for all hands to indulge in the satanic fascination of reading other people's mail. We had a chance to read a copy of a letter from Mr. Andrew Fletcher, president of St. Joseph Lead Co., to Mr. Kremer Bain, consultant at the company's Bonne Terre office. Actually, it wasn't marked "Personal," but it does bring to light an achievement worth reading about.

Dear Kremer:

We certainly wish to extend to you and your associates hearty congratulations on having completed the sinking of shaft #25 without a lost time accident, and thereby making a total of 2,322 ft completed in the three shafts without a lost-time accident. This is indeed an outstanding accomplishment.

Sincerely,
Andrew Fletcher

It turns out that not only do three out of every four men prefer milder, less irritating breakfast cereals, but three out of every four men can make up intelligent sentences using "and" five times in a row. Several correspondents resorted to subterfuge, but a number latched on to a legitimate solution which we can illustrate by the note from **Mr. T. Hawken** at Delnite Mines, up in Timmins, Ont.

A pub keeper wanted a new sign painted for his inn, "The Coach and Horses."

When he saw the preliminary sketch, he said, "It's too crowded. Leave a little more space between 'Coach' and 'and' and 'and' and 'Horses'."

A basically unkind but interesting variation of this technique came from **Mr. Malcolm Lowry** at St. Joe's Balmat plant.

Since any mining engineer or geologist is notorious for being unable to produce the same grade of ore for the mill even two days in a row, it surprises me not that you are unable to produce the five "ands" in a row.

A difficult problem for a mining engineer, usually proves to be muck soup for a millman, therefore I turned my attention to your problem. Obviously the most interesting part of the subject should be the attractive Miss Deane herself. Investigating the latest AIME directory affords the interesting clue that Sheila Deane lists herself as a mineralogist, not a geologist as you describe her.

It is therefore apparent that Miss Deane would concur with this mineral beneficiator's opinion that any "friendly, pretty" member of the fair sex should have as little connection as possible with "a geologist." Consequently, on the third line of your published paragraph concerning Sheila Deane, there are two places where far more spacing should be inserted. The amount of space should be greatly increased between 'pretty' and 'and' and 'and' and 'a geologist'."

A magnificent job was turned in by **Mr. R. J. Brison** of Columbus, Ohio.

On the subjects of prepositions and "and" and 'and-painted neckties, please note that if I didn't put quote marks around "and," the meaning might not be clear as it would be difficult to distinguish between "and" and "'and'" and "'and'" and "and" and "and" and "'and."

In addition to Messrs. Hawken, Lowry and Brison, we will send prizes (First Editions of "A Gourmet's Guide to Hackensack, New Jersey") to **Mr. W. P. Batdorf** of Chicago and **Mr. J. B. van der Graaf** of Arnhem, Netherlands.

Runner-up prizes, copies of one of the new do-it-yourself books, "How to Build Your Own Swamp," go to **Mr. H. B. Humphrey,** Arlington, Va.; **Mr. R. A. Wyman,** Arvida, Quebec; and **Mr. B. A. Miller,** London, England. Many thanks, nearly everybody.

And for those of scientific bent, we offer a surefire method for telling male goldfish from female goldfish. Place the goldfish whose sex is to be determined in a one-quart mason jar almost filled with water. To the contents add two ounces of sulphuric acid. If he comes floating to the top he's a male. If she comes floating to the top, she's a female.

ENGINEERING AND MINING JOURNAL

JANUARY 1955

Twenty-Five Years of Service

TWENTY-FIVE YEARS isn't of much significance in the genesis of an orebody, or even in the productive life of the greatest of them. But in the life of a man, and in the development of an industry, a twenty-five year span can command respect.

The particular quarter-century we're talking about began on Jan. 1, 1930, when the first issue of a new weekly paper, called *E&MJ Metal and Mineral Markets* was published.

This month, *M&MM* begins its twenty-sixth year of publication, changed considerably in appearance, but undeviating from the simple and straightforward ideal on which it was founded.

Metal and Mineral Markets was, and still is, one of the few publications in the whole broad field of commercial journalism that is primarily and intentionally devoted to performing a service rather than to making a profit. Part of this quality arises from the circumstances in which *M&MM* is published, and part is due to the character of the men who have developed this price-reporting service over the years. Walter Ingalls, and after him men like E. H. Robie, Felix Wormser, Simon Strauss, Harry Wolf, all helped build *E&MJ's* market service into a separate and useful publication.

On the masthead of that first issue of *M&MM* 25 years ago appeared the name of Hans H. Wanders, market editor. In all the intervening years Mr. Wanders has held his paper, and his market reporting, rigidly to the highest standards of accuracy, reliability, and integrity.

All the other members of *E&MJ's* editorial staff take particular pride in the world-wide reputation for dependability and trustworthiness that Mr. Wanders and *Metal and Mineral Markets* have built. The widespread use that is made in the mineral industries of *E&MJ* quotations on metals and minerals is not only a source of pride to us all—it is also a clear-cut mandate to be worthy of this trust.

Together, Mr. Wanders and George Cleaver, his associate, begin the second twenty-five years of service to the mineral industries, as keenly aware as ever of the great responsibility they bear, and as determined as ever to discharge it well.

Let's Help With the Census

IF YOUR COMPANY IS A PART OF, or has anything to do with, the mineral industries, its planning for the future is strongly shaped by facts about the mining industry itself. How many units? How many workers? How high a wage? What value of product? Cost of supplies? Power consumption?

This sort of information helps tremendously in evaluating the industry's place in the country's economy and your company's place in the industry. But it's no help at all if the facts are out of date.

That's why the Bureau of the Census begins a campaign early this year to bring up to date its facts on the mining industry. Data now available tell what the industry was like in 1939, mildly interesting, perhaps, but of value only for purposes of comparison.

To give you live, usable figures to compare with the records of 1939, the Census Bureau asks your company's cooperation in filling out the questionnaire they are sending you. It will take a few minutes' time, but it will be a small price to pay for knowing accurately how your industry stacks up *today*, not 15 years ago.

MEXICO'S three new sulphur operations, at San Cristobal, Jaltipan and Salinas, are clustered within a relatively small area of the Isthmus of Tehuantepec. The properties are particularly well-situated for reaching most ports of the world.

A New Empire of Frasch Process Sulphur Is Rising From the Jungles of Mexico

JOHN H. KEARNEY
E&MJ News Editor

A NEW EMPIRE of Frasch process sulphur has been won from the jungles of Mexico's Isthmus of Tehuantepec in the State of Vera Cruz.

While still an infant, this empire shows promise of growing up to be one of the major producers of the world. Like output from the United States giants, Texas Gulf Sulphur Co. and Freeport Sulphur Co., this new sulphur is flowing from salt domes which line the grand arc of the Gulf of Mexico.

Parents of this new source of Frasch process sulphur are the Brady brothers, Lawrence, Ashton and William. Through their American Sulphur Co., a holding company, the Brady's own substantial interests in the three firms which form the empire. These three companies are:

Mexican Gulf Sulphur Co., which in 1954 produced 55,000 long tons and this year expects to produce 200,000 long tons;

Pan American Sulphur Co., which after a November start produced 30,000 long tons in 1954 but plans to produce 500,000 long tons this year;

Gulf Sulphur Corp., which is now under construction and plans first production in June, aiming at a 1955 output total of 90,000 long tons.

When all three companies are operating at capacity output, probably in 1956, they expect to be producing some 1-million tons annually. Some United States sulphur officials believe that these figures are optimistic. Officials of the three companies in Mexico feel that they have good reason to be optimistic.

This new source of sulphur will be a major contribution toward satisfying the industrial world's appetite, particularly for Frasch process sulphur. Value of this contribution may be partially measured against the fact that total output of sulphur in all forms in the United States during 1954 was an estimated 6.6-million long tons. Of this, some 5,450,000 tons were produced by the process used successfully for the first time in De-

cember 1894 by Herman Frasch near Orange, Texas.

Where will the new sulphur be marketed? Mexico's domestic requirements will have to be met first, but the bulk of production will be exported. When, and if, the companies do attain an aggregate annual output of 1-million tons, this still will be only about one-sixth of United States production. However, 1-million tons nearly equals that tonnage of United States production now being exported.

This will affect the export market, but not necessarily price-wise. Officials of all three Mexican companies say that there are no plans to break the U. S. export price, currently at $31. Rather, they feel that the market is wide enough to accommodate both U. S. and Mexican producers.

Both Harry C. Webb, a 25-yr veteran with Texas Gulf Sulphur Co., president of Pan American Sulphur Co., and Paul Nachtman, an attorney,

Webb

Nachtman

president and counsel of Mexican Gulf Sulphur Co., state definitely that they do not expect to undercut the U. S. price.

Webb commented, "The outlook for the sale of our product is particularly bright. We have made a full and careful analysis of the economics of the world sulphur picture. This analysis disclosed that the world is still reacting to the acute shortage of Frasch process sulphur which developed during the period of the Korean War. We do not expect to undercut the U. S. price in order to capture markets. There seems to be an availability of market sufficient for all of us at the moment."

Nachtman in November made a 25-day trip through Europe and returned confident over the sulphur sales situation.

In the United Kingdom, for example, Nachtman said, one of England's foremost authorities estimated that 70,000 tons of sulphur had been used for carbon bisulphide alone in 1954. He predicts that this single use will require 95,000 tons in 1960, 120,000 tons in 1965 and 153,000 tons in 1970.

"On the whole, the 14 countries surveyed are expected to increase their sulphur consumption in 1955 up to

Lawrence Brady

Ashton Brady

William Brady

After many disappointments, a "poor boy" brought them success.

THE BRADY STORY

PERHAPS the most distinguishing characteristic of the Brady's is that throughout their adult lives they've been determinedly trying to hit something big which would be theirs.

When ventures failed and circumstances forced them to work on another's payroll, it was always just until one of the three brothers came up with something promising.

Several times before they discovered sulphur on the Isthmus of Tehuantepec in 1945, the Brady's had come close to making fortunes, mostly in oil. They participated in the oil boom in Tampico, Mexico, in 1922. At one time they held leases on the Venezuelan territory where today hundreds of oil derricks are bringing up fortunes for others. Once Ashton rode five days—each way—on horseback and on muleback to examine a gold prospect in Durango, Mexico.

While in 1945 it wasn't exactly true that they didn't know where their next frijole was coming from, certainly second servings were scarce. Just finding a job was easy. Lawrence, the eldest, is an attorney; Ashton is a geologist, and Bill, the youngest, is an experienced executive with a native's knowledge of Spanish and a thorough familiarity with the workings of business in Latin America. But simply finding a job wasn't their goal.

One reason the Brady's became interested in salt dome sulphur was that in that field they could use their knowledge of handling drill rigs. Also, they knew that oil brought up at San Cristobal on the Isthmus of Tehuantepec came from salt dome formations.

In old drilling logs, Ashton found sulphur mentioned, just incidentally. But what he saw convinced him that a first-hand look was warranted.

After a tortuous journey to San Cristobal, Ashton found that his problems had only begun. His drilling rig, weighing about 30 tons, had to be moved nearly two miles through dense jungle. Ashton speaks with admiration of the industriousness of the local Mexicans. In tropic heat, at the height of the rainy season, they hacked the way clear with machetes. Mules and oxen edged the rig forward. It took them a week to cover the two miles.

The first well was a bust and half the financial backers dropped out. When the second well turned out to be a bust also, the remaining backers deserted.

Ashton, nevertheless, still had faith in the dome. With difficulty, Bill and Lawrence raised enough pesos for the third well. "You can say we 'poor-boyed' that one," Ashton told this reporter. "We had oxen hauling five-gallon cans of water from the river to the rig."

Ashton and a handful of others wore grim expressions when drilling began on that third well. This had to be it—another bust probably would have meant the end of the line.

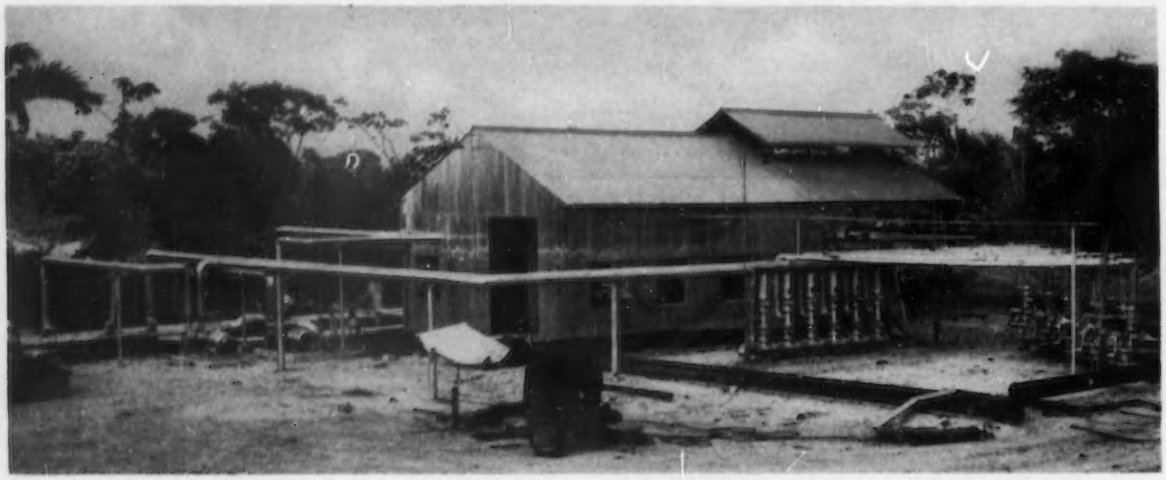
Lawrence and Bill were in Mexico City when Ashton's phone call came through. "We've hit it," Ashton said. "We've got some sulphur down here." That was in the fall of 1945.

Lady Luck, who, so it seemed, had been looking the other way, now turned to smile on the Brady's. When sending a sample from the third well up to Mexico City for analysis, they missed the intended flight. That plane crashed into the famed volcano, Popocatepetl.

Even after hitting sulphur, the Brady's had trouble financing development. Rumors that they were just promoters, that the Frasch process wouldn't work in their domes and many others plagued their quest for capital. Time has proven those rumors to be false.

The Brady's formed the American Sulphur Co., through which they have interests in the companies which are to mine the sulphur. Two of those companies are producing now; a third is slated to get underway in June.

MEXSUL'S PLANT, at San Cristobal, made of steel and aluminum, covers 31,000 sq ft. After an investment of more than US$6-million, Mexsul last March brought up the first Frasch process sulphur produced outside the United States.



RELAY STATION, or sulphur station, at San Cristobal, controls the flow of superheated water from boilers to sulphur wells, controls compressed air flow to the wells and receives and weighs molten sulphur from the field.

10%," Nachtman commented. "Most of the sulphur users interviewed were highly complimentary of the United States producers; but, at the same time, they were frankly enthusiastic over the availability of new sulphur sources in Mexico. They are now convinced that Mexico will shortly become one of the world's leading sulphur producers."

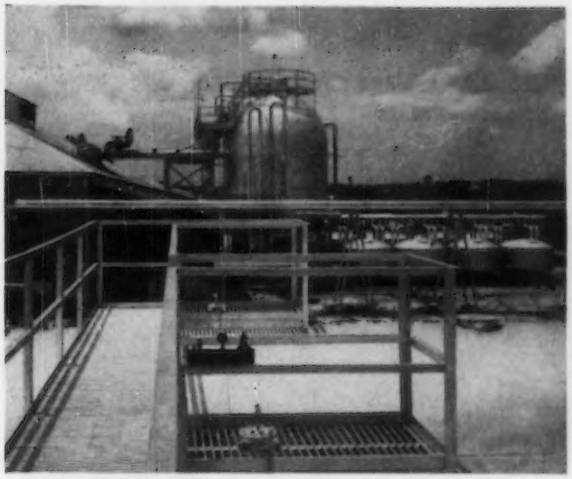
While the three companies operate separately and are competitors, there are many characteristics common to all.

- All have especially favorable shipping facilities. Coatzacoalcos is a Gulf of Mexico port, deep enough to handle ocean-going vessels with a draft up to 28 ft. The Panama Canal is relatively close. Minatitlan and Coatzacoalcos both are on railroads which serve all of Mexico. In addition, there is a 192-mi railroad linking Coatzacoalcos with Salina Cruz on the Pacific Coast.
- There is an adequate supply of fresh water. Mexican Gulf and Gulf Sulphur are on the Coachapan River; Pan American is near the Chacalapa River.
- Fuel oil also is available locally, from Petroleos Mexicanos's refinery at Minatitlan.
- A local labor supply includes many workers experienced in handling drill rigs through the region's oil background.
- Minatitlan boasts a serviceable airport, which is only 2½ hr from Mexico City and is the stepping-off place for visitors to all three sulphur properties.
- No neutralization of sulphur gases is necessary since all three operations occupy land surrounded by jungle and distant from habitation centers.
- All three have received special tax consideration from the Mexican Government which has greatly welcomed this development and has extended much friendly cooperation.

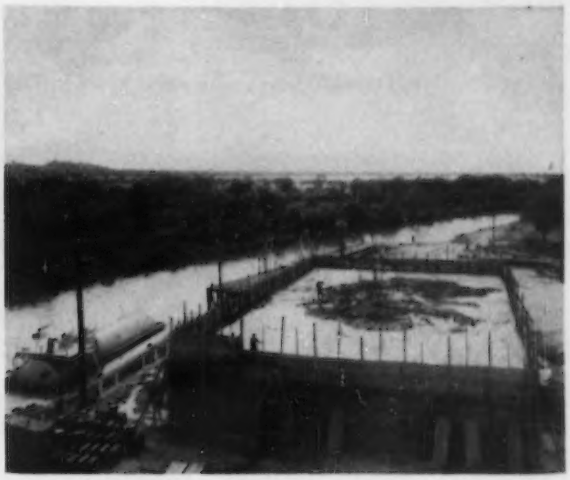
First of the firms to come into production was Mexican Gulf Sulphur Co., or Mexsul, which is working the San Cristobal Dome, 36 mi up the Coatzacoalcos and Coachapan Rivers from the port of Coatzacoalcos and 16 mi over the same route from Minatitlan.

At San Cristobal, last March 15, the first Frasch process sulphur produced outside the United States flowed from Mexsul's wells. By historical coincidence, the first oil produced in Mexico was brought up at San Cristobal a half-century ago.

Walter H. Maddox, consulting geologist for both Mexsul and Gulf Sulphur, states that at San Cristobal some 2,830,000 tons can be estimated on the



WATER SOFTENERS and filters in the rear of Mexsul's plant help to prepare Coachapan River water for use in the boilers.



INSULATED BARGE, moored at San Cristobal, transports molten sulphur to Coatzacoalcos. Note sulphur storage vat.

basis of drilling on only 125 acres of Mexsul's 1,482-acre concession.

Mexsul currently is producing about 300 long tons daily from five wells. Nachtman expects this to be boosted to at least 600 long tons daily when a giant new boiler is added, probably within four months.

Water from the Coachapan River, soft to begin with, is pumped 1¼ mi to Mexsul's $5-million plant where two water softeners using a lime and soda ash process ready the water for the boilers.

How Process Works

In three boilers, water is heated to an average temperature of 320 deg F and pumped down into the porous sulphur-bearing limestone at the rate of 1.1-million gpd. Sulphur melts at about 240 deg F. The sulphur wells are boosted 12-18 hrs. This superheated water is put down under light pressure and both the degree and the temperature of the water are watched closely. Molten sulphur collects at the base of the well. It is brought to the surface through air-lift. Compressed air is driven through a 1-in. pipe into the wells at pressures which vary up to 500 lb psi with each well. A 3-in. pipe is used to bring up the molten sulphur.

The five wells now in production are about 1,000 ft from the relay station. This relay station, frequently called a sulphur station, performs three functions: it controls the flow of the superheated water from the boilers to the sulphur wells in the field; it controls the compressed air flow to the wells, and it is here that molten sulphur from the wells is collected and measured in a 60-ton pan. From the pan, the molten sulphur is pumped in an 8-in. pipe nearly 2 mi to docks on the Coachapan River. Sulphur is retained in a molten state with live steam carried through a 1¼-in. gut line inside the 8-in. line.

At the Coachapan docks, the molten sulphur is either pumped into 500-ton capacity insulated barges for the 36-mi trip to Coatzacoalcos or is pumped into reserve storage vats at dockside where it is allowed to cool and solidify. As shipments from these reserve storage vats are warranted, the hard sulphur is broken and loaded into open barges by a 3½-yd power shovel.

These reserve storage vats were used to stockpile sulphur until dock, storage and loading facilities were completed at Coatzacoalcos. It was expected that these facilities would be completed this month. Anticipating this completion, Mexsul has been shipping molten sulphur from San Cristobal to Coatzacoalcos since Nov. 15.

At Coatzacoalcos, a maneuverable distributor directs the flow of the molten sulphur into any of three vats which have a combined capacity of 90,600 tons. From these vats, two 3-yd clamshells load the solidified sulphur into a hopper which empties onto a 36-in. wide neoprene conveyor belt.

The sulphur is automatically weighed while moving along on the conveyor belt before it is discharged directly into holds of waiting ships. In this manner, more than 400 tph can be loaded.

Although bright yellow sulphur has been found on the San Cristobal concession, the five wells thus far have been working in off-color sulphur which has a carbonaceous content of two-tenths of 1%. However, this meets the 99.5% purity standards of commercial Frasch process sulphur and it is free of arsenic, selenium and tellurium. While this off-color characteristic of the sulphur produced thus far poses no major problem, Mexsul plans as part of its expansion to erect a filter plant this year at Coatzacoalcos.

Other expansion plans include a laboratory at San Cristobal and the addition of a fourth boiler which would boost plant capacity to 2.1-million gallons of superheated water a day. After this boiler is added, Nachtman says Mexsul will put on an additional five wells.

Bleedwater, even from 10 wells, can be accommodated in two impounding reservoirs which together cover 650 acres. From these reservoirs, heavy rainfall induces a clean run-off back into the Coachapan River.

At San Cristobal, Chris Elliott, formerly with Texas Gulf Sulphur Co. at New Gulf, Texas, is general pro-

Elliott

Barnard

duction manager. William Barnard, formerly with the Fresnillo Co. in Zacatecas, Mexico, is plant manager.

James L. Riddel, executive vice president, is located in Mexico City. Riddel formerly was with the Export-Import Bank in Washington. Also at the Mexico City offices is Eugenio de Anzorena, Mexican diplomat, who is domestic sales director for Mexico for Mexsul's operating subsidiary, Mexican Sulphur Co., S. A.

Including an extensive marine de-

STEVE RICHARDS (left) and Harold Jaquet keep Jaltipan operation moving.

PAN AMERICAN'S US$6-million installation at Jaltipan, largest of the three, built by Brown & Root, can produce 3.3-million gpd of superheated water.

partment both at San Cristobal and Coatzacoalcos. Mexsul employs some 280 workers, 99% of whom are Mexican. In accordance with Mexican law, all three companies have Mexican understudies to any foreign technicians.

Among other financial backers is the Export-Import Bank, which has granted a $3,972,000 5% promissory note which is to be repaid in nine semi-annual installments beginning this June 30th.

Second company to come into production, and the one slated to be the largest of the three, was Pan American Sulphur Co., which is working the Jaltipan Dome, 25 mi from Coatzacoalcos.

Pan American began well-testing late last September and came into production in November. Coolness of the dome necessitated a concentrated heating program. This, however, presented no major problem to Harold H. Jaquet, vice president in charge of sulphur operations of Pan Am's Mexican operating subsidiary, Gulf Sulphur Company de Mexico, S. A. Jaquet, formerly with Jefferson Lake Sulphur Co., is widely-regarded as one of the world's finest Frasch process operators.

Pan Am is now producing about 1,000 tons daily from 10 wells, according to Harry Webb. He expects Pan Am to produce 400,000 to 600,000 long tons of sulphur this year.

The plant at Jaltipan is designed to introduce 3.3-million gallons of water daily into its 10 operating wells at 335 deg F. However, Pan Am has made provision for a 50% increase in productive capacity at relatively small expense when market conditions call for such an expansion, Webb said.

Pan Am's plant and operating areas are near the center of some 22,000 acres which make up the Jaltipan and Potrerillos concessions. On the basis of 69 exploratory wells, proven and probable reserves were estimated at 11,827,911 long tons. After 61 additional exploratory wells, John C. Myers, independent geologist and petroleum engineer, estimated that there was more than twice the original tonnage estimated in Pan Am's concessions.

Fresh Water Supply

A $6-million plant, Pan Am's operation boasts four boilers. Fresh water is obtained from the Chacalapa River, a swiftly-flowing stream during the rainy season when it is fed by run-off from the Sierra Madre Oriental but relatively quiet at other times of the year.

To assure a constant supply of water, two reservoirs have been built. These reservoirs are designed to store 350-million gallons—about 100 days supply. A 9,000 gpm capacity pumping station on the banks of the Chacalapa delivers water from the river to the reservoirs, 1500 ft distant.

The reservoirs serve as settling tanks. As needed, the water flows by gravitation another 350 ft to final settling tanks in the rear of the plant. As at San Cristobal, the water is treated by lime and soda ash before it is sent into the boilers.

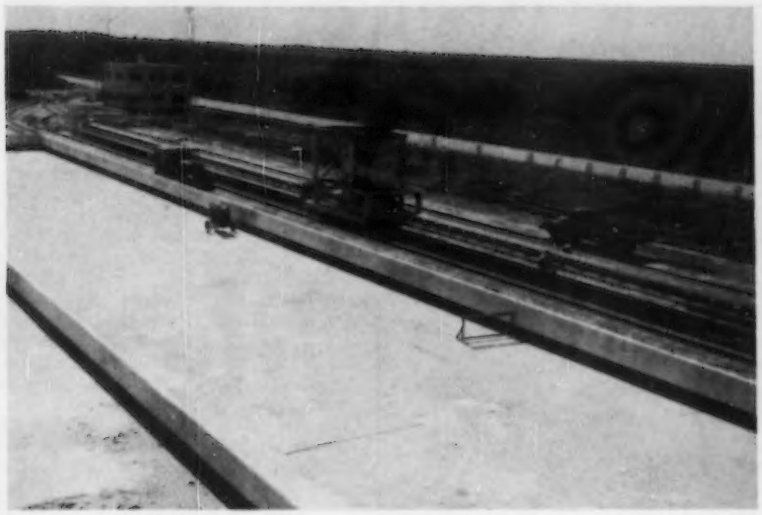
Present operating area for the 10 wells is 5,000 ft from the plant. Pan Am's relay station, 650 ft from the wells, houses a 120-ton pan. Also like the San Cristobal operation, air-release traps are not used and the molten sulphur incoming from the wells discharges into the pan in intermittent gushes, as illustrated by the cover picture.

From the relay station the molten sulphur is pumped through a 6-in. insulated pipe-line (with a 2-in. gut line) 4,280 ft to reserve storage vats alongside a double-track spur railroad built by Pan Am to connect with the railroad to Coatzacoalcos. Present vats have a capacity of 125,000 metric tons and there is area and trackage available to expand this storage capacity to 600,000 tons. In the present vats, a maneuverable distributor directs the flow of molten sulphur over the vat surface where it cools and hardens.

As shipments from these vats are warranted, a 2-yd diesel shovel can load a 50-ton gondola in 10-15 minutes. Gondolas are furnished by the nationalized railroad—another instance of government cooperation. These cars are moved in 10-20 gondola trains, pulled by a 30-ton diesel locomotive. While being loaded into the gondolas, the sulphur is weighed automatically by a 100 ton-capacity scale.

Once at Coatzacoalcos, the loaded train is taken over by a 20-ton diesel locomotive which draws the gondolas along a 17,000 metric ton storage bin, located at dockside. Here a gantry-type, rail-mounted crane with a 3-yd clamshell shifts the sulphur from the gondola into the bin. It takes only 10-15 minutes to unload each car.

For shipment to consumers, the same clamshell is used to transfer the sulphur into a 5 ton-capacity hopper. From the hopper the sulphur is dis-



PAN AMERICAN'S dock, storage bin and belt-conveyor system, shown here in an early stage, are now completed. Holds of three ships can be accommodated.

ASHTON BRADY (left) and "Count" Gene Rossi watch construction at Salinas.

charged onto a 42-in. wide conveyor belt which can move a capacity-load of 500 tph. The belt, of rubber especially designed to handle sulphur, moves over a weighing device which automatically measures the loading sulphur.

Instead of the sulphur discharging directly from the belt into a ship's hold, it moves into a telescopic funnel or chute which directs the flow. The chute is so designed that it can trim the edges of the hold, thereby saving time and labor costs.

At Jaltipan, in addition to Jaquet, the operating staff includes Stephen M. Richards, formerly with Texas Gulf at Spindletop, Texas, chief engineer; F. G. Vasek, formerly of Jefferson Lake, relay station supervisor; Chris E. Armstrong, formerly of Woodley Petroleum Co., production and drilling manager; Richard Mills, formerly with Jefferson Lake, production superintendent, and Dr. Fred Gormley, formerly with Texas Gulf, chief chemist in charge of Pan Am's laboratory.

Financing of Pan Am's operation included $4,414,000 in loan commitments from the Export-Import Bank.

Construction of the third company's plant, that of Gulf Sulphur Corp. began Oct. 18. American Sulphur Co. has put up $2½-million to help finance this operation.

Through its Mexican operating subsidiary, Cia. de Azufre Veracruz, S. A., Gulf Sulphur owns exploration and exploitation rights in 30 sulphur concessions comprising 7,414 acres. These concessions line the Coachapan River on the shore opposite Mexsul's plant.

Gulf Sulphur's plant, being built 2 mi upriver from San Cristobal, is to handle 1.4-million gallons of superheated water daily. A $5-million plant, it is so designed that boiler capacity can be boosted to 3-million gpd without shutting down operations.

Initial production on Gulf's Salinas Dome is planned for a minimum of 600 long tpd. The Brady's expect that this will be upped to 1,000 long tpd in 1956.

The plant itself is being built 500 yd inland from the Coachapan River and is connected by a canal, 90 ft wide, 15 ft deep and 400 yd long. This canal will accommodate 500-ton capacity insulated barges.

Water will be pumped from the canal to a 9-million gallon settling base, near the plant. Sulphur from five wells initially planned will be pumped through 8-in. lines (1¼-in. gut lines) 300 ft to a relay station where it will be collected in an 80-ton pan. From there it will be pumped an additional 1500 ft to the canal where it will be directly introduced into the barges.

Whereas Gulf Sulphur will have its own storage vat at Coatzacoalcos, it plans to use Mexsul's dock facilities.

It gives Walter Maddox pleasure to discuss Gulf Sulphur's reserves. Maddox states that within 64.3 acres of Gulf's 7,414-acre concession, 10-million tons have been proven and an additional 2½-million tons are probable. One well, which he describes as "the most beautiful I've ever seen," reportedly yielded cores which showed 565 ft of sulphur-bearing limestone.

Ashton Brady has taken development of this property under his personal direction. He is working closely with officials of Hudson Engineering Co., plant contractors. Assisting Ashton Brady is "Count" Eugene Rossi, who has known the Brady's since oil-drilling days in Texas. Also at Salinas are Louis Davis, of Hudson, who is construction superintendent, and Amos Tumlinson, formerly of Texas Gulf, who is field superintendent.

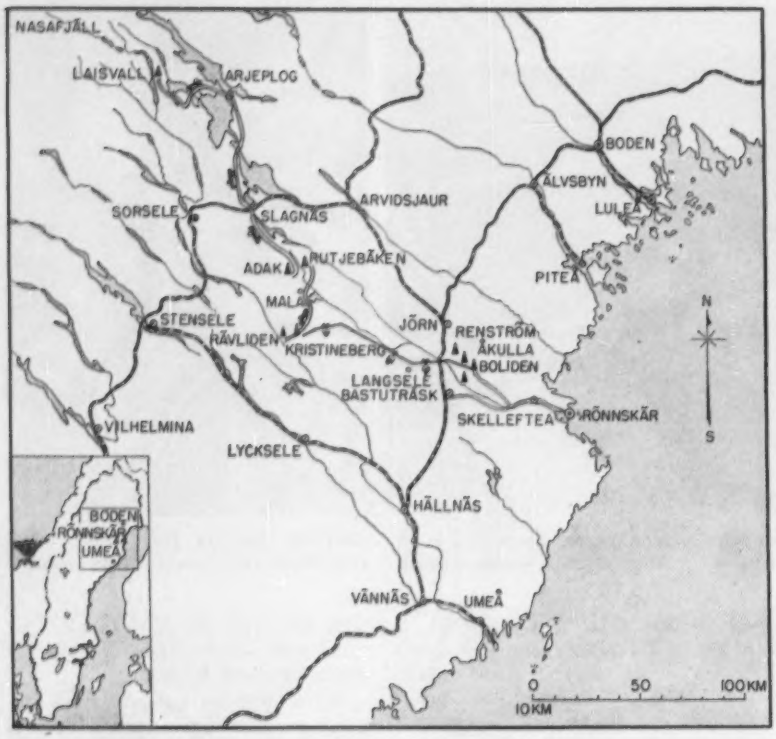
The rise of this new industry not only has breathed life into the Isthmus of Tehuantepec but is expected to be a stimulant to Mexican industry in general.

Walter H. Maddox, consulting geologist, briefly describes the geology of the region in this manner: "These concessions occupy a portion of the Isthmus known to be a former saline basin. Geologic structures here have been formed due to flowage of salt and it is probable that the various structures in this immediate area are subordinate to a regional uplift of the salt mass, resulting in a piercement type of dome or anticline.

Maddox

"Sediments of Middle and Lower Tertiary Age are found on the surface. These consist of massive dark gray shale and occasional lenses of gray sand and volcanic ash showing dips of up to 15 deg.

"The exact age of the salt is unknown but fossils of Cretaceous Age have been found in a number of instances in formations stratigraphically higher than the salt."



MAP SHOWS BOLIDEN and surrounding area, described in text above. Note trucks, cableways, ore deposits as indicated.

BOLIDEN'S MINES

The railway from the smelting works joins the main railway line at Bastuträsk and the company's own railway to Boliden at Slind. Triangles on both sides of the Skellefteå river denote ore deposits of different kinds which have been, are being, or will be worked. In this area are Boliden, Akulla, Renström, Adak, Rudtjebäcken, Kristineberg and Rävliden. At present these deposits are being mined, while at Långsele, production will start in 1955. These deposits produce various amounts of copper, zinc and pyrite concentrates. Farthest to the north is Laisvall, a lead deposit which in a few years' time will be producing lead concentrates with 80% lead amounting to about 20,000 metric tons of lead metal annually. To the west of Laisvall is the old silver mine of Nasafjäll, which was discovered in 1635 and has been worked a number of times up to the early 19th century. It has been bought by the company, which thus obtained a historically interesting mine but, unfortunately, no ore.

Products of the mines are transported by truck, cableway and railway to Rönnskär, where copper and lead concentrates are refined into metals, while pyrite and zinc concentrates are shipped to customers in Sweden and abroad.

Large Metallurgical Units Feature

O. HERNERYD
Skelleftehamn, Sweden

HUGE PRODUCTION UNITS and steady expansion of both size and diversification of products have characterized Boliden Mining Co.'s Rönnskär works since its construction in 1929. Located in the north of Sweden in the township of Skelleftea, it rises from a long, narrow peninsula which extends about 2 km into the Gulf of Bothnia.

When construction was started in 1929 the peninsula (see photo p 79) occupied an area of 500,000 sq m, but has been increased to about 1-million sq m through dumping of slag and tailings from concentration. The dumping areas are expected to be filled about 1970, and from then on it will be necessary to transport the refuse out into the Gulf of Bothnia, since dumps higher than the present level are undesirable. The chimney, 145 m high, dominates the picture. The harbor is to the left of it, and the large buildings at the extreme right are the arsenic warehouses where large quantities of raw arsenic are stored, a kind of arsenic deposit that will last for many years.

The scale of activity at Rönnskär is indicated by the fact that at the end of 1953 there were 1,500 workers and 450 monthly paid employees comprising 50% of the company's total number of employees. In 1953 about 210-million kw hr were consumed, which is about 1% of Sweden's total production of electric energy. 70% of this energy is used for smelting, electrolysis and steam generation, while the remainder supplies the Rönnskär Works with electric light and keeps its 5,360 electric motors going. These figures do not include the mines whose energy consumption is about one-third of that of the Rönnskär Works.

First, a few general remarks about the new construction, valued at 75-million kronor, which has been going on at Rönnskär since 1946. As is well known, large scale production is cheaper than small scale. An essential reason for this is that large quantities make possible the use of large production and transportation units and far-reaching mechanization. With a small pro-

Production at Boliden's Rönnskär Works

	1930	1935	1940	1945	1950	1951	1952	1953
CONCENTRATES:								
Iron pyrites....tons	...	10,500	84,424	194,478	350,296	353,564	361,944	331,490
Zinc.....tons	...	.....	.....	8,809	16,511	16,931	15,143	21,015
METALS A. MISC.								
Copper.....tons	531	5,537	10,029	18,398	25,943	27,025	28,785	30,276
Lead.....tons	...	.....	.....	7,711	16,681	9,482	11,394	16,412
Silver.....kg	930	18,941	23,707	24,338	20,374	19,034	18,473	30,441
Gold.....kg	369	6,803	6,500	2,327	1,560	2,240	4,293	3,068
Selenium....tons	...	23	68	30	27	35	48	53
Bismuth....tons	...	27	72	33	64	24	23	28
As-products....tons	...	6,034	3,302	5,396	13,735	17,908	15,062	1,042
Sulphuric acid.....tons	...	.....	.....	.....	.....	.....	.....	2,803

PENINSULA GROWS with tailings dump. Arsenic warehouses are at right, harbor left. Bay of Bothnia extends in the distance.

Boliden's Rönnskär Works

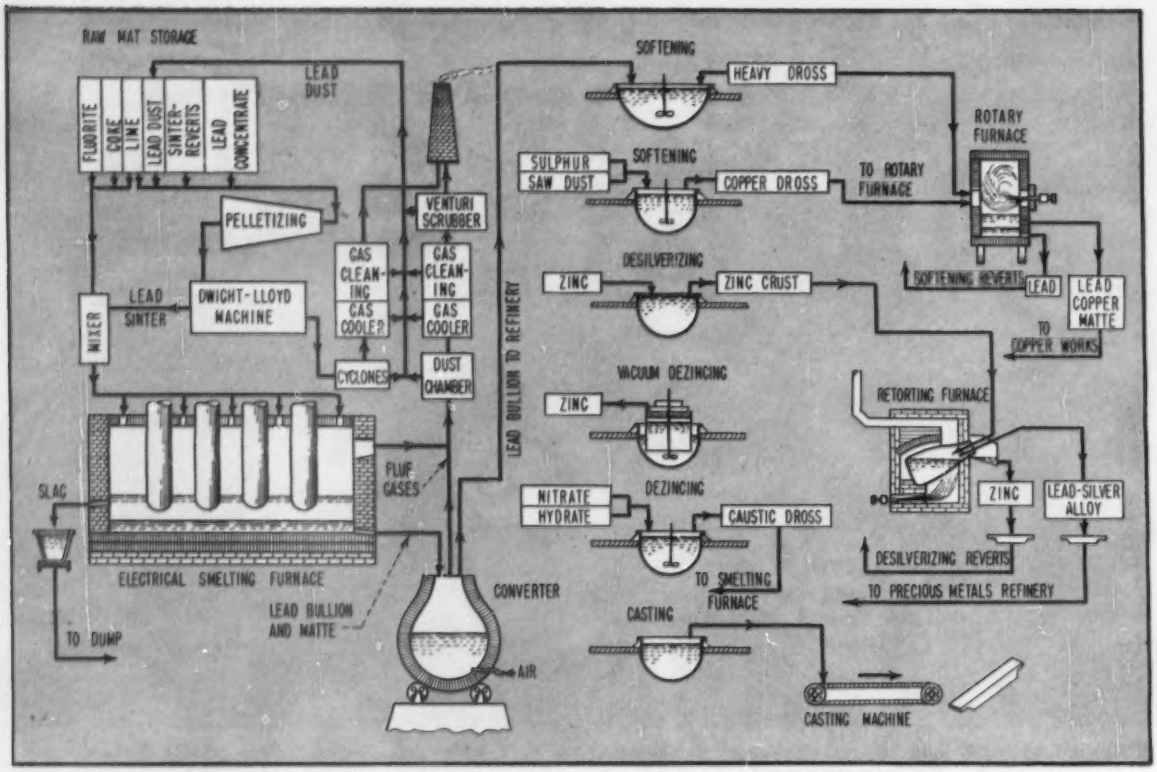
duction it is, of course, also possible to utilize the largest units, but the limit is arrived at when the entire production can be conducted in *one* unit; this has also in many cases been the goal of the rationalizations. Furthermore the production takes place in the daytime whenever possible; this is for instance the case with all casting. This means furnaces and casting machines three times as large as production in three shifts, but a labor force reduced by nearly two-thirds. The application of these principles entails considerable capital outlay, but the production costs are reduced to a corresponding degree. Thus, the Rönnskär works often have as large production and transportation units as the biggest American copper works, although the production is only one-tenth of theirs.

As a consequence of this reasoning, one 12,000 kva electric smelting furnace has been built to melt 175,000 to 200,000 tons of copper ore and concentrates per year. Two of the largest copper converters manufactured in the U. S. have been purchased. Only one of these is used at a time while the other is being repaired or is kept in reserve (the production period is about 2 months). Liquid blister copper is gathered in one anode furnace during two shifts and is cast during the third. One casting machine for anodes has been installed. A second anode furnace is kept in reserve. For melting cathodes and casting wire bars, billets, etc., one arc furnace and one casting machine are used. A plant producing about 45,000 tons of sulphuric acid per year has also been built as one unit. Finally a sintering plant for lead concentrates is being built, where one Dwight-Lloyd machine will be installed. This will be used only 5 to 6 hr per day.

Extension Limits

Sometimes, however, it is not possible to build units as large as would seem preferable. Technical or other considerations may make it necessary to progress by stages. But after completion of the extension one most commonly regrets not having taken further steps. Here is an example. A few years ago, the refining pots for lead held 50 tons as everywhere on the continent. They were increased to 90 tons, which proved very advantageous. Some time later a 250-ton pot was tried for refining and it was, of course, even better. Because of production economy the refinery now ought to be rebuilt, but then the question arises whether, for instance, 500-ton pots might not be even more economical. The cost for a treated charge is the same whether the charge that is being refined is 50 or 500 tons.

A consistent application of the principles described above, creates, of course, difficulties in several respects. To the extent that production is not continuous, great pulsations arise, which means that furnaces, etc. must have sufficient dimensions for storage of considerable quantities of molten material. Furthermore, it is sometimes too expensive to keep an additional large unit in reserve when it may need to be used perhaps only once every second year. When older furnaces and machinery can be left standing, a certain reserve is created. Sometimes it is also advisable to plan for a comparatively large additional capacity for the big units in proportion to the desired annual production. The latter method means on one hand, that the load, (per sq m of the smelting area) becomes limited and shutdowns for repair are reduced. On the other, that when a shutdown is necessary, the loss in production can be quickly recouped. There must always be cer-



LEAD CONCENTRATES, running about 80% Pb, are treated in smelting plant, equipped with 4,000 kw electric furnace. Lead is taken to converters where lead sulphide is oxidized. "Pure" product then goes to refinery for removal of copper, silver.

tain quantities in storage as an offset to irregularities in the production. When working with only one production unit without a reserve, there is for obvious reasons a complete set of spare parts, brick, etc. so that repairs can be made in the shortest possible time.

As a result of modernization, all handling, loading and unloading are done by cranes of different kinds. Where there are no permanent cranes, mobile cranes are used. Mechanization or automatic handling has been introduced where feasible.

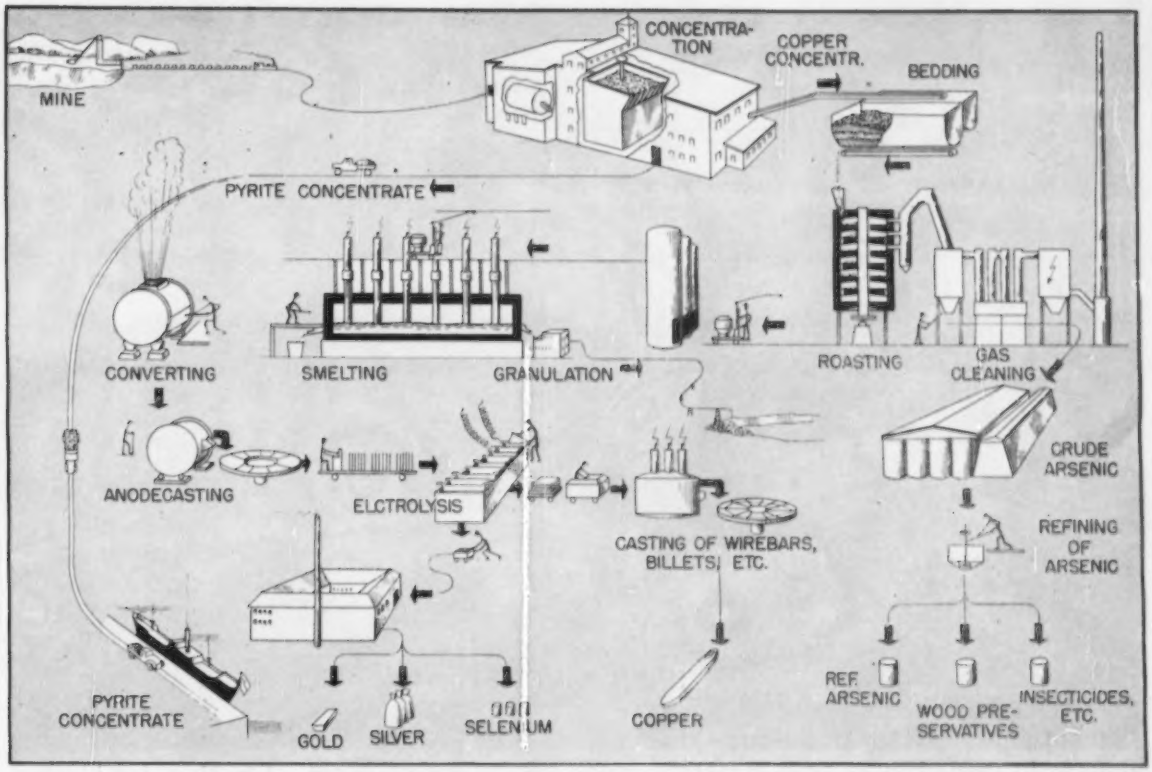
Sulphide material containing copper and precious metals is roasted in multiple-hearth roasters to remove some of the sulphur and all the arsenic. The As_2O_3 formed is removed from the gases in an electric gas cleaning system and is then refined or used for the manufacture of different arsenic products. Some of the sulphur is permitted to remain in the calcine so that in the subsequent smelting it may combine with iron and copper to form a liquid sulphide phase, the so-called matte. The iron oxidized during the roasting process is fluxed in the furnace with silica. The matte is transferred to and blown in converters to blister copper; the iron is oxidized and fluxed and the sulphur disappears as SO_2.

Blister copper which contains gold, silver, selenium, etc. is cast into anodes and electrolyzed in a solution of copper sulphate and sulphuric acid with copper precipitated on the cathodes in a very pure form. Gold, silver, selenium, etc. are recovered as a slime at the bottom of the tanks. Copper cathodes are remelted and cast into the special shapes requested by metal works and wire mills.

Copper Furnace

The electric copper smelting furnace replaces two reverberatory furnaces. Inside dimensions are: length 23.5 m; width 6 m; and height 3.15 m, giving a smelting area of 141 sq. m. It is heated by Söderberg electrodes, which have a dia of 1.2 m. Each electrode is equipped with a transformer of 2,000 kva. Total smelting capacity is about 11,600 kw. About 175,000 tons of partly pre-heated materials are smelted in this furnace annually and the consumption of energy corresponds to 400 kwh/ton of solid material. The smelting load in the furnace amounts to 60-70 kw/sq m of smelting area, including electrodes. This is considerably lower than reckoned with for Tysland-Hole furnaces. Slag is tapped from the furnace to the left (see p 83) and the matte, which is rich in copper, on the opposite side. Through this arrangement, and thanks to the length of the furnace, it is possible to carry out counter-current smelting; the percentage of copper of the slag can therefore be kept on a low level. At the present time copper fetches a price of about 3.30 kronor per kg. Since about 150,000 tons of slag are produced annually, each tenth percentage of copper in the slag means a loss of 500,000 kronor per year so that slag losses must be kept at an absolute minimum. The furnace is therefore charged with material rich in copper, closest to the point where the matte is tapped (to the right in figure) and with low grade material on the opposite side. The rich slag which is formed by contact with the rich material must, before it can leave the furnace, pass through the entire length of the furnace and through the zone where low grade material is charged. During this process a change of balance occurs which is facilitated by the stirring effect of the convection currents created in the slag round the electrodes. Thus the slag tapped from the furnace is poor in copper (at present about 0.3% Cu) and is approximately in equilibrium with the low grade material in the slag tapping end of the furnace.

Slag is tapped to a granulating plant



COPPER FLOWSHEET shows main flow of products and by-products through installation. Arsenic is stored pending expansion of demand from Swedish and foreign consumers. Slag losses are reduced by introduction of rich material close to tap point.

(see page 83), where it is run into water and granulated to a fine gravel consistency. After adding more water, it is moved by specially designed pumps to dams about 500-600 m from the furnace. Formerly, liquid slag was transported from the furnace by rail.

Production in the furnace was started in 1949 and continued without interruption until December 1951, about 2½ years, when it had to be stopped due to power shortage. If this stoppage had not been necessary, uninterrupted production would certainly still continue, for it appeared that only slight repair of the brick was necessary. The furnace returned to production in March 1952, and power supply is guaranteed for a long time to come.

The matte is tapped (see page 82) into 25-ton ladles on the converter aisle. These ladles are conveyed by a 50-ton crane to newly-built copper converters. These two converters are the largest that could be obtained from the U. S. With the present copper production of about 30,000 tons, only one of them is used at a time. Earlier the converter aisle contained 7 smaller converters for a production of only about 15,000 tons. The American converters, which take a full charge of about 100 tons copper each, have worked very well and made possible a very large saving of labor and material.

Behind the converters a waste-heat boiler (of La Mont design) has been built, in which about 25,000 tons of steam is generated annually, from the heat content of the converter gases. This is probably the first time that utilization of heat from such gases has been successful.

The blister copper obtained from the converters is conveyed to a plant for the casting of anodes.

Anode Casting

The casting wheel in front of a tiltable cylindrical furnace can receive more than a 115-ton copper charge from the converters as the anode moulds to be filled are one by one moved to the furnace. Diametrically opposite the pouring point the anodes are automatically lifted off the moulds and placed in a water tank for cooling, while the mould, after being sprayed with bone ash, continues to the casting point to be re-filled. This plant, which shows a number of new designs, has been used since December 1952 and, in comparison with former hand casting the number of workers required could be greatly reduced. The anodes continue to the refinery. The latter has not been the object of any thorough modernization and will not be described here.

Cathodes arriving from the refinery were formerly melted in oil reverberatory furnaces and the copper manually cast into wire bars. However, a new copper casting plant has been built where the cathodes are melted in a 6,000 kva electric-arc furnace holding about 40 tons, very similar to an electric steel furnace. After the adjusting of the temperature in a low frequency furnace, the copper is machine cast into wire bars, billets or cakes according to the buyer's request. Production in this plant came into full production during 1954.

In the entire process it is of the greatest importance to obtain the highest possible recovery of copper. It has been mentioned above how the smelting is conducted with regard to this fact. It is, however, also very important that in loading, storing and transportation, material is handled so that losses are avoided as far as possible. There is some waste, but this is to a certain extent recovered by having all storage space concreted and provided with overflow drains, which make it possible to recover metal-containing slimes washed away by rain. As far as possible all transport routes have been asphalted and in the same way

RESEARCH LABORATORY was scene of 215,000 analyses during 1953. Chimney (center) marks experimental hall. More than 115 persons are employed in this modern laboratory, each section headed by university graduate or engineer.

provided with overflow drains. Since the roads are asphalted, the whole plant can be machine swept and sweepings returned to the furnace.

The Lead Process

The examination of the Laisvall orebody started in 1940, and ore dressing experiments showed that it was possible to produce high grade lead concentrates with about 80% Pb and 13.5% S. With this type of high grade concentrates containing only about 6.5% impurities it seemed wrong to use the ordinary shaft furnace process in which the charge should not contain more than 45% Pb. Smelting experiments therefore began in 1950, which, after trying different methods, have led on to the process which is today used at Rönnskär.

Concentrates are bedded together with return dust from smelting furnace and converters. About 5% burnt lime is added. The bedded material is roasted at about 700 deg C in multiple-hearth furnaces, fired with oil. Total sulphur content diminishes during the roasting to 9-10% S. The roasting takes place under such conditions that some PbS is transformed to $PbSO_4$ and, to a smaller degree to PbO, while the rest remains unchanged as PbS.

The calcined ore is smelted in a 4,000-kw electric furnace as shown.

In this process, slag, which is tapped once or twice daily, and lead, slightly contaminated with lead sulphide, are formed. The lead is taken to converters and the lead sulphide is oxidized or gasified so that comparatively pure lead is obtained in the converter. In liquid form this is transported by crane to the refinery (see page 80, center), where copper and silver are removed in 90-ton pots. The lead is then cast into ingots by a continuous process on a casting machine.

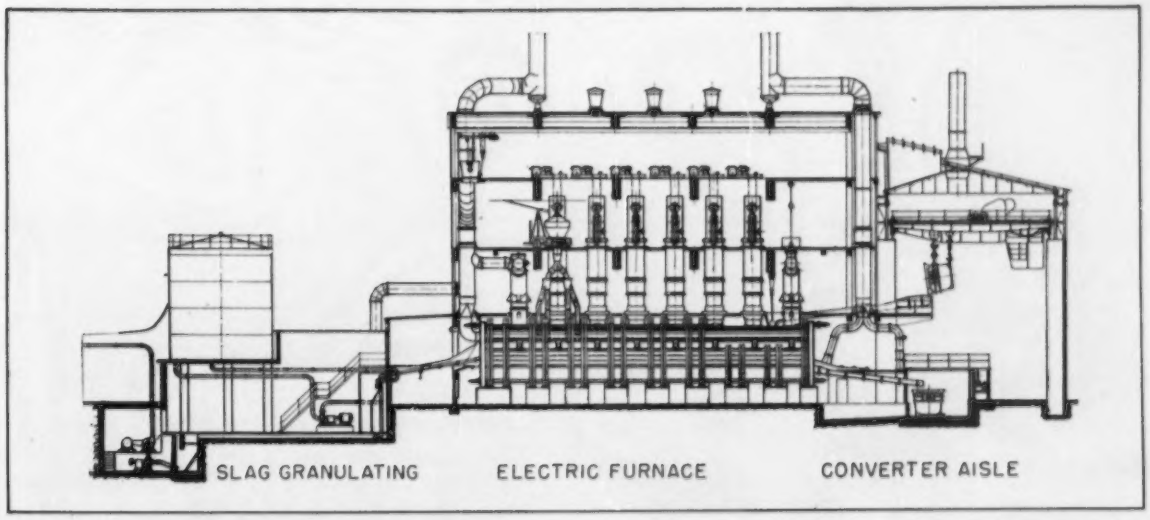
Vacuum Dezincing

Interesting feature in this process is the so-called vacuum dezincing, a method brought from the U. S. Zinc has to be added to the molten lead when it is to be desilverized. When the lead cools, the main part of this zinc is skimmed off together with the silver, but some zinc remains in the lead and could previously be reduced only by chlorination or treatment with different chemicals. According to the American method a cylinder is lowered into the lead and evacuated with a vacuum pump, while at the same time the lead is heated to about 700 deg C. The zinc then distills from the melt and is deposited on the water-cooled roof of the cylinder. After 3 to 4 hr the distillation is completed, and the zinc content of the lead reduced to approximately 0.005%.

At present a sintering plant is being built which will eliminate the difficult roasting of lead concentrates. According to the method which has been developed at our research laboratory, return sinters consisting of pellets of about 10 mm will, in 3 successive pelletizing drums, be covered with concentric layers of lead dust, lime and lead concentrates, the latter amounting to about 50% of the weight of the pellets. These pellets are then charged on a continuously working Dwight-Lloyd sintering machine (width-1.5 m; length-23.5 m; sintering surface 27 sq m) where the sintering is carried out in the usual way.

First Dwight-Lloyd

This is the first Dwight-Lloyd machine to be installed in Sweden. Formerly, the lead works have not been capable of sintering material containing more than 45% lead, because a melt containing lead and other free-flowing compounds is formed, which easily clogs the grates. But if the sintering is done as described above, it works with a lead content of up to 80% Pb, as shown by half scale experiments. When this sintering plant gets



ELECTRIC COPPER SMELTER handles approximately 175,000 preheated tons of material annually. Smelting load in furnace amounts to 60 to 70 kw per sq m of smelting area. Slag is tapped from the left side and the copper-rich matte from right.

started, capacity of the lead works will increase from about 20,000 tons of lead at the present time to nearly 30,000 tons. By that time it is also estimated that the company's own lead deposits and some mines in central Sweden will have increased their production of concentrates to such a degree that lead production in this scale, based on Swedish material, will be possible. This means that Sweden will not only be self-supporting in lead but will also begin to export to the world market.

Lead production of Sweden for the year 1953 (recoverable) was 26,140 short tons. In 1952 the figure was 22,700.

Sulphuric Acid

Boliden has been producing sulphuric acid since autumn 1953. Previously, since the early thirties, very large quantities of sulphur, sometimes more than 50,000 tons per year, have escaped with the smoke from the chimney. Attempts have also been made to produce sulphur out of these gases, but a plant which was built in 1933 proved to be very uneconomical, and production was stopped in the early 1940's. A plant for the production of sulphuric acid out of the waste gases has recently been completed and will in its first stage produce 35,000 to 50,000 tons of concentrated sulphuric acid per year. As the market in northern Sweden is limited, the surplus will have to be sold in central Sweden. If there should be a demand for additional quantities, production of sulphuric acid could be increased in a second stage without the need of any other raw material than the sulphuric gases which today escape from the plant chimney.

An interesting sideline is the production of both forged and cast ball-mill balls. During the war a press and an electric annealing furnace were purchased, and balls for the mines were produced out of purchased material. During a visit to the U. S., one of the company's engineers came into contact with a firm which manufactured such balls by casting. A contract was made with this firm, and experiments were started at the Rönnskär works. The result was that in 1951 production could be started with an 8-ton 2500 kva electric furnace. Through continuous casting in sand, steel balls of 35-50 mm diameter with a hardness of 50 to 60 Rockwell C are produced. The balls are at present used principally by our mines but certain quantities are also sold to other consumers on the Swedish market. The production in 1953 was about 2,000 tons.

The Laboratory

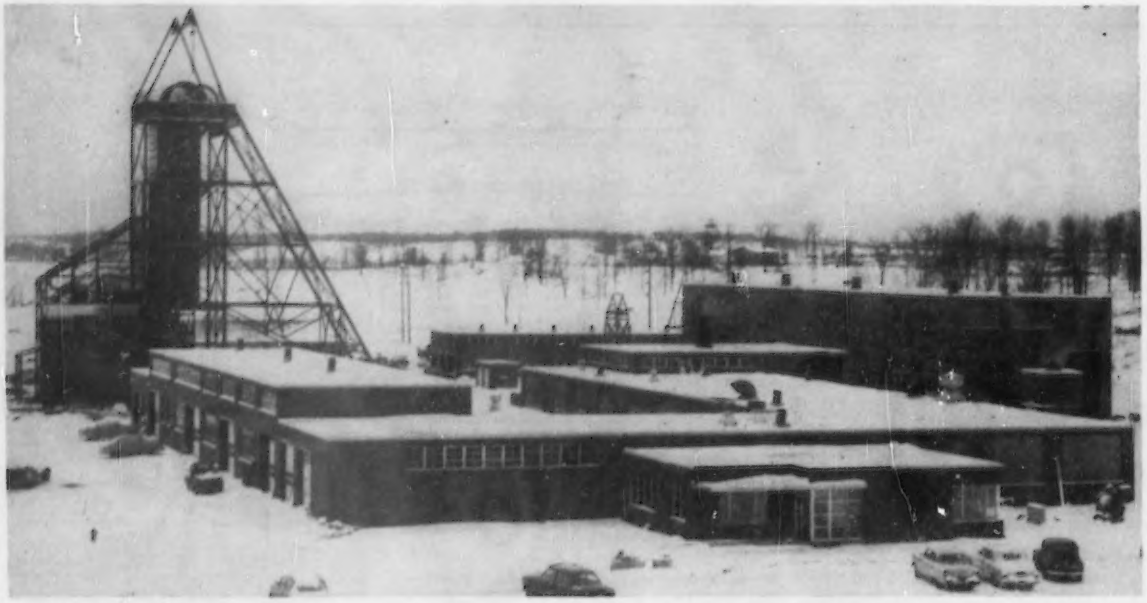
The research laboratory which was completed in 1948 and is composed of three stories plus a mezzanine. Including the experimental hall, whose chimney appears above the roof of the laboratory, the total floor area is 1,750 sq m. 115 persons are employed in the laboratory. About half the space is used for chemical and spectrographic analysis. In 1953, 54 persons in the chemical analytical department made 135,000 analyses, or 2,500 per person annually; five employees in the spectral analytical department made 80,000 analyses, or 16,000 per person annually. In both cases the difficulty of the analysis has been about the same.

The remaining part of the building is occupied by the research and service departments. The research department consists of four sections for metallurgical, chemical, battery and physical research. Each section is headed by a university graduate or engineer, and the total number of employees in the research department is 30, of which 13 have university education. The total expenses for research in 1953 were, for the Rönnskär works alone, 1,050,000 kronor. The production costs of the Rönnskär works (excluding the metal value of the products) were about 50-million kronor, which means that the costs for research amounted to 2% of the production costs. Salaries in the research department amounted to more than half a million kronor which was 2½% of the total salaries paid, 22-million kronor (workers and monthly paid employees). These are high figures even in comparison with American standards.

The laboratory is well equipped with modern apparatus of different kinds and thus has very large resources. Its tasks can generally be classified as applied research with new or improved processes in view for existing products, or for new products as far as our ore deposits provide a foundation for such.

Full Cooperation

Through having the laboratory in direct connection with the production, the two departments have excellent contacts, which, on one hand, result in the research men getting the practical technical problems placed before them, and, on the other, lead to very good cooperation between production and research.



THE CANNON MINE has installed some of the most modern surface and underground equipment in the Iron Country. Plant includes shops and warehouses (left), office (center), enginehouse (right), and equipment garage (center background).

How They Sank The Cannon Mine Shaft

G. A. KOEHLER
Superintendent, Cannon Mine Property
M. A. Hanna Co., Iron River, Mich.

THE CANNON* MINE PROPERTY, three miles southeast of Iron River, Mich., on the Menominee Range, consists of 21 adjoining forties, which will be served in the future by the Cannon shaft. Some mining and considerable exploration work has been done on six of these 40-acre tracts in the past by other operating companies, however, over a period of years they were acquired by the M. A. Hanna Co. and in 1952 were grouped under the name of the Cannon mine.

Present mining operations are being conducted on a small scale through the Bengal Shaft, which lies 1600 ft west of the new Cannon Shaft. This shaft is approximately 900 ft deep and it is from this level that extensive exploration has been conducted by diamond drilling to justify the new mine plant and shaft.

Before shaft sinking was started and during the planning stages of the mine, three diamond drill holes and one churn drill hole were put down at the proposed shaft site. The diamond drill holes were to prove the nonexistence of ore at the shaft site—the churn drill hole to test structure of the overburden. The type of overburden would dictate the method used to extend a shaft from surface to ledge. Results of the drilling showed a static water elevation at 15 ft below the surface and a very fine sandy structure practically all the way to ledge. A few seams of clay and hardpan were encountered but were of small consequence.

Start With Drop Shaft

After weighing results of drilling, together with methods available for reaching ledge, it was decided that a concrete drop shaft would be the most economical and positive method of sinking through the saturated overburden. A contractor, specializing in caisson work, was consulted and work was started in the fall of 1951 to sink the drop shaft.

Equipment required to start the caisson consisted of the cutting shoe (a 1 in. thick fabricated steel shoe on the cutting edge of the caisson) (see Fig. A), 1 in. bent reinforcing bars, reusable plywood forms for the outside of the shaft and reusable shiplap forms for the inside of the shaft (see Fig. B and B1), one ¾-yd crane with clamshell bucket and the necessary trucks for hauling equipment and excavated material.

The procedure consisted of forming and pouring 4 ft to 8 ft sections of concrete with the cutting shoe as a base (see Fig. C). The center of the rectangular shaft was then clammed out and the shaft allowed to drop of its own weight. Shaft dimensions at this point (at the concrete above the shoe) are 15 ft 6 in. x 20 ft inside, with walls 5 ft 6 in. thick. This thickness diminished to 4 ft 3 in. at the shaft collar by successive steps of 2½ in. each on the inside of the shaft. The outside faces of the caisson are smooth to eliminate excessive drag on the concrete as it worked downward.

Sinking progress was made at the rate of 8 ft per 10 calendar days to a depth of 87 ft. Some hardpan and boulders were encountered and sinking was slowed to about 4 in. per 8-hr shift. At this point it was necessary to install a deep well pump in the shaft and dewater so that men could work on the bottom with chunk breakers and remove boulders from under the shoe. With the removal of the water from inside the shaft there was a large difference in pressure between the outside and inside of the shaft and a sand run resulted which rose 27 ft in the shaft. Shaft was then allowed to fill with water and clamming begun again.

Since it was impossible to clam di-

* Named for G. M. Cannon, present management consultant, who played such an important part in the acquisition and consolidation of the properties comprising this mine.

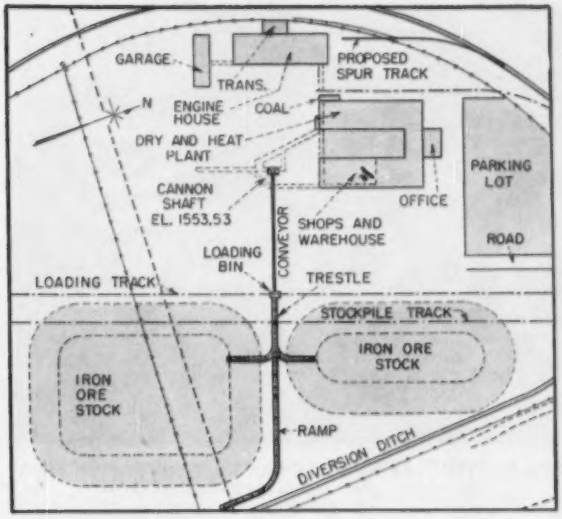


FIG. 1 SURFACE PLANT of Cannon property includes buildings shown on previous page, and ore stockpile areas.

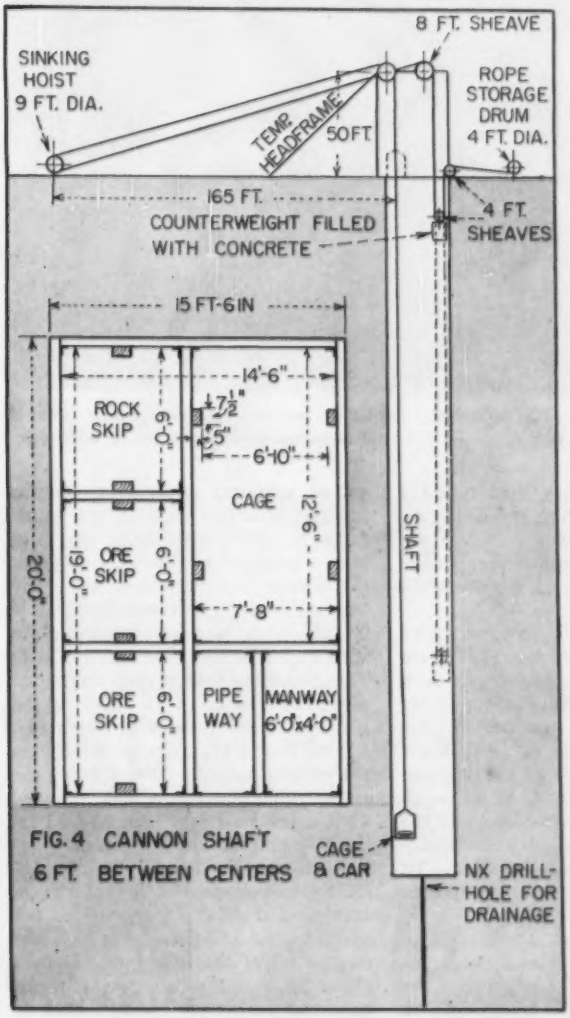


FIG. 4 (left) Plan of all-steel sets of Cannon mine shaft.
FIG. 5 (right) Counter-balance hoisting scheme for sinking. Note scheme for paying out counterweight rope.

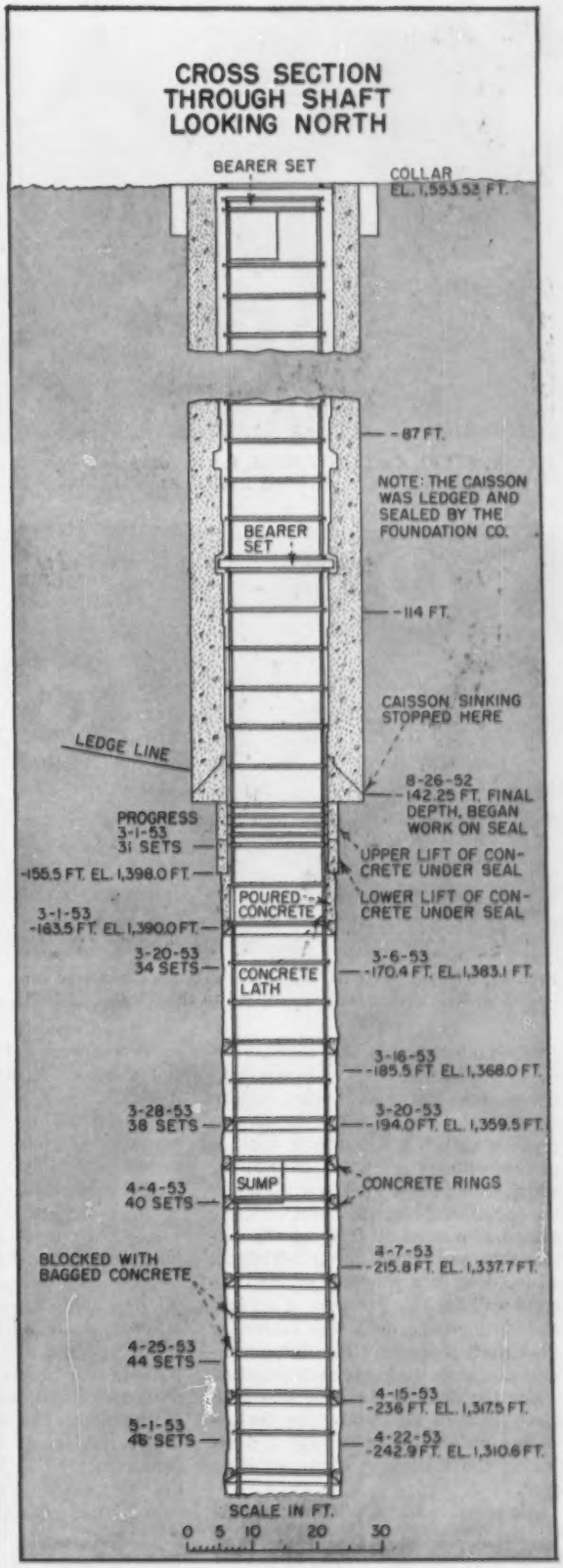


FIG. 3. PROGRESS IN SHAFT SINKING is shown diagrammatically above. Final position of concrete drop shaft was 142.65 ft below collar of the shaft.

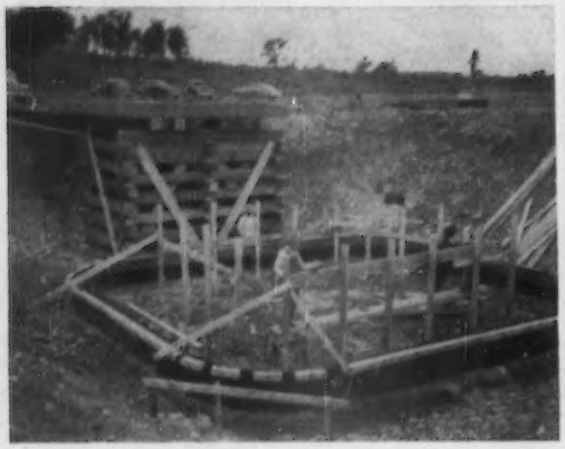


FIG. A. STEEL CUTTING SHOE for the drop-shaft caisson installation is set in place and leveled. Aug. 28, 1951.

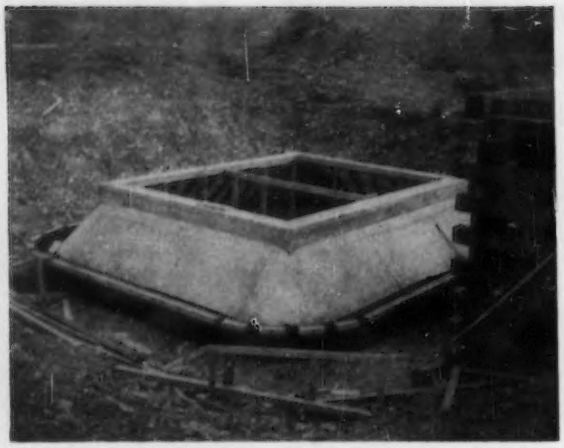


FIG. B. INSIDE FORM of the concrete caisson is mounted on top of the steel cutting shoe. Sept. 4, 1951.

FIG. B1. INSIDE AND OUTSIDE FORMS are attached to cutting shoe. Reinforcing rods are welded to shoe. Sept. 12, 1951.

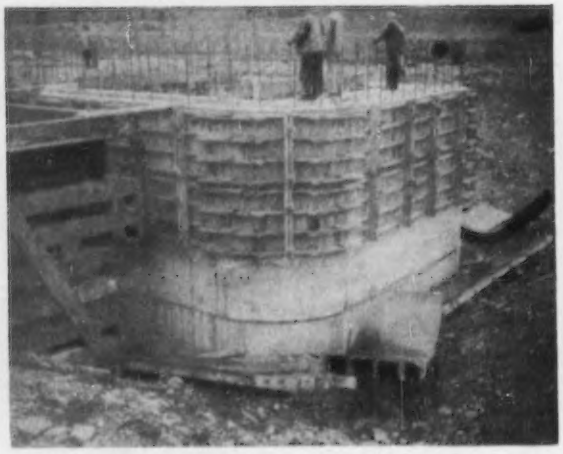


FIG. C. ABOUT 24-FT of concrete has been poured. Shoe is now about 11 ft deep. Forms are used over again on next pour.

rectly under the cutting shoe to remove boulders on the west side (the harder side) the caisson began to lean to the east (see Fig. D). It was impossible to bring the caisson back to plumb without going to air pressure which would allow men to work under the shoe. A 24-in. steel and concrete deck was poured 50 ft above the cutting shoe and joined into a 3-ft high x 14-in. deep key way left in the concrete wall for this purpose. Cast into and through the deck was a circular steel shaft topped by the decompression chamber. Air pressure required under the deck made it necessary to place 29 ft of sand above the deck—adding weight to the caisson and reducing the thickness of the concrete deck.

Air pressure was applied to the caisson the first week in May 1952. Due to the depth of the caisson at this time (114 ft) pressure required was 42 psi. Under this pressure the men were able to work one hour and required 45 min to decompress. They then rested 4 hours before repeating the sequence. Thus each man worked only 2 hr per 8-hr shift. Three crews were finally "broken in" giving us six hours work on the bottom in 24 hr.

The caisson was ledged and sealed by the middle of September 1952 (see Fig. F). By Oct. 12 the pressure deck had been removed and excavation below the caisson seal was started. No blasting was allowed and all rock excavated was taken by means of pavement breakers. On Oct. 15 the weak rock in the northeast corner of the shaft broke loose and allowed about 5 ft of sand to flow into the shaft. To repair this break, it was decided to drive sheet piling horizontally under the seal to exclude any possibility of a future run. This work was completed and a 3 ft thick ring inside the caisson was poured (except on the north side which was 5½ ft thick) through which grout pipes were left (see Fig. 2). After this ring had gained sufficient strength, grout was pumped in under the seal under high pressure. Five grout holes were also driven from surface on the outside of the caisson. Through these holes 920 bags of cement grout were pumped.

The inside ring was taken out in sections 2 ft to 4 ft wide and 6 ft high. These open sections of rock were then moiled to a depth of 18 in. under the seal and firmly rock bolted (see Fig. E and Fig. E1). Forms were then placed and concrete poured filling the void. This procedure was followed until a full wall 6 ft high and 18 in. thick was placed under the seal.

Rock conditions under the new 18-in. thick wall proved to be soft so another 6 ft of shaft was moiled out and a second 18-in. wall 6 ft high was poured under the first wall. It then appeared that the rock was much harder at the bottom and that blasting was possible.

During the period between the last sand rush and the final placing of the

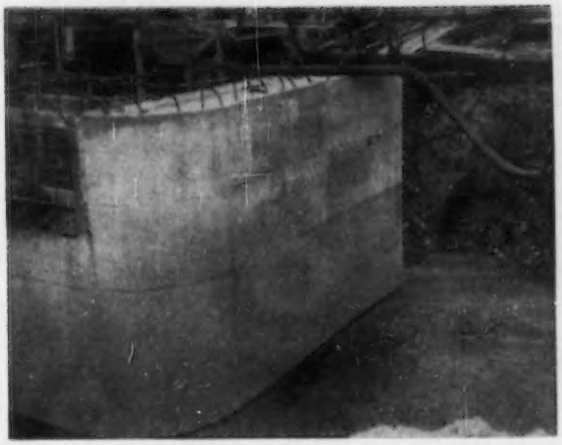


FIG. D. CAISSON IS 130 FT DEEP, and 24-in. out of plumb. Compressed air is introduced under shoe on high side.

FIG. E. SECTION UNDER CAISSON SEAL is opened up and rock bolted, ready for forms and concrete.

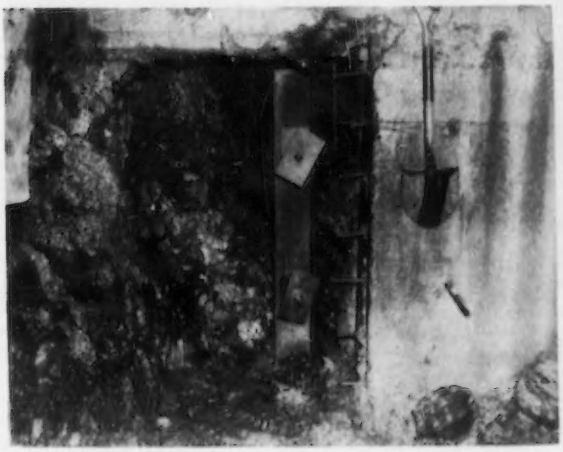


FIG. E1. CONCRETE WALL HAS BEEN POURED on right side under caisson. Shovel at right hangs on end of grout pipe.

FIG. F. CAISSON WAS LEDGED AND SEALED by mid-September 1952. By Oct. 12, 1952, the pressure deck was out.

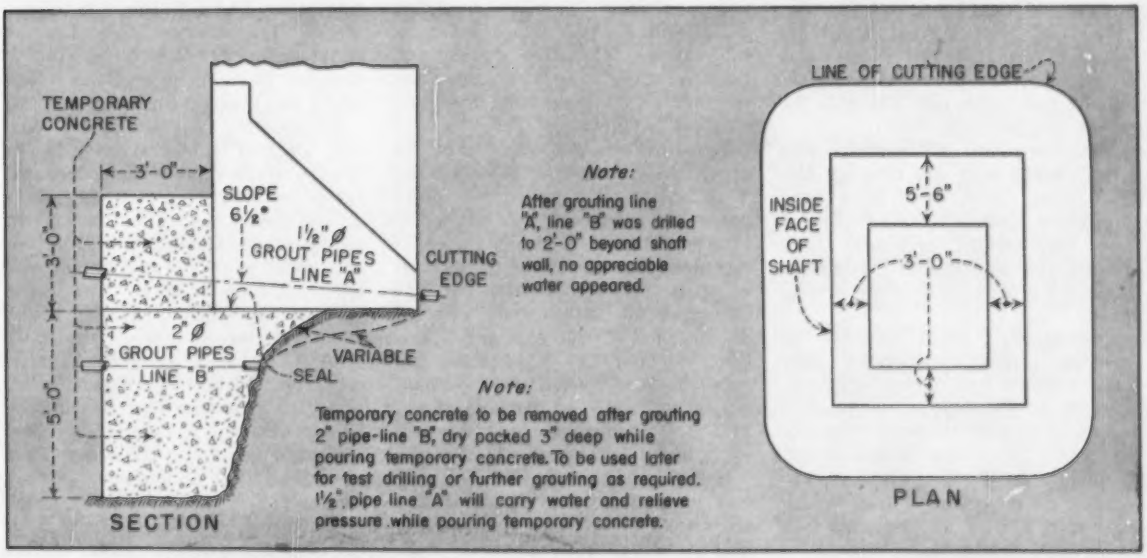

TEMPORARY CONCRETE
3'-0"
SLOPE 6½"
1½" Ø GROUT PIPES LINE "A"
CUTTING EDGE
2" Ø GROUT PIPES LINE "B"
VARIABLE SEAL
5'-0"
5'-0"
SECTION
Note:
After grouting line "A", line "B" was drilled to 2'-0" beyond shaft wall, no appreciable water appeared.
Note:
Temporary concrete to be removed after grouting 2" pipe-line "B", dry packed 3" deep while pouring temporary concrete. To be used later for test drilling or further grouting as required. 1½" pipe line "A" will carry water and relieve pressure while pouring temporary concrete.
LINE OF CUTTING EDGE
INSIDE FACE OF SHAFT
5'-6"
3'-0"
PLAN

FIG. 2. SECTION AND PLAN of concrete seal poured at base of caisson. Note 1¼ and 2-in. grout pipe lines. After the concrete ring had hardened, about 920 bags of cement were pumped through these lines and others extending from the surface.

bottom 18-in. wall, a vertical NX diamond drill hole in the center of the shaft was drilled to the sixth level elevation where it connected to the drift from the Bengal shaft. This hole provided drainage and allowed us to remove our pumps and discharge column from the shaft so that shaft steel could be placed in the caisson. Since there were no obstructions in the caisson, bearers were set on the bottom key-way (left in the caisson) and shaft sets were then assembled on surface and lowered into the caisson with the ¾-yd mobile crane, building the sets from the bottom up. Another set of bearer beams were placed on surface for additional security. Under the bottom bearing set, shaft sets were hung at regular intervals (6-ft centers on sets) until we reached the 18-in. wall under the caisson. At this point the center-to-center interval of shaft sets was reduced to 2 ft and five sets were hung at this interval, thereby adding extra strength to the walls under the seal.

Regular shaft sinking procedure was then started; however, only one-third of the shaft was blasted at one time with holes drilled only 4 ft deep to reduce jarring and concussion. This procedure was followed to a total depth of 177 ft before a full shaft round was attempted (see Fig. 3).

Shaft Drill Rounds

The average drill round for the first 500 ft of shaft consisted of 84 holes of which four were 4-ft V-cut holes in the center of the shaft, 16 were 6-ft V-cut holes, 16 were 10-ft V-cut holes and 48 were 8-ft vertical or nearly vertical holes (see Fig. G).

The first 500 ft of shaft was fairly soft iron formation and slates which drilled easily and produced an exceptionally fine muck pile, desirable for use of the Hydro-mucker.

Fifty-five-pound jackhammers with 1-in. hexagon steel and tungsten carbide insert bits have been used throughout. Certain zones were harder than the average and two 35-lb weights were attached to the handles of the machines to further aid drilling speed.

Occasionally when slabby or "drummy" ground is encountered, rock bolts are used with plates, angles or channels on the shaft sides. Blasting is done electrically with 40% special gelex using 220 v on a parallel circuit. Mucking is done with a ⅜-yd Hydro-mucker dumping into a tray, which in turn is hoisted and dumped into a car on the sinking cage.

Shaft measures 15½ ft by 20 ft outside of steel and is divided into the six compartments as shown in Fig. 4. Two ore skips will operate in balance and a double deck cage will operate in balance with a rock skip. It has been general practice in the Lake Superior District to operate the cage in balance with a dummy or counterweight. However, it was felt in this case that much development rock could be hoisted during cage idle periods and a skip would make a fair counterweight for normal cage use.

Shaft steel throughout is composed of 6-in. 25-lb H sections with the exception of studdles and clip angles which are 4 x 4 x x ⅜ in. angle iron.

The cage will ride on four runners, each 5 x 7½ in. The skips will ride on two runners, each runner to be 6 x 10 in.

Lap-joint concrete lath in widths from 6 to 10 in.. are set in the "H" beams and form the lining for the shaft. Behind this lath the voids are filled tight with split-cedar lagging. The skipways are laced off from the cage way with No. 9 gage, flattened, galvanized, expanded metal clamped to the steel.

Temporary Hoist Starts Job

The initial 900 ft of shaft was sunk using a temporary hoist and a temporary wooden headframe. The only available hoist for sinking purposes was powered with a 250-hp motor which was not adequate to pull the load without using a counterweight. A rather unique method of shaft sinking with a counterweight was devised and put into operation. It consisted of the sinking hoist, two main headframe sheaves, a counterweight with a sheave wheel, an auxiliary sheave wheel and a small winch hoist for rope storage. The necessary length of hoisting cable for the cage was wrapped on the main hoist drum and attached to the cage. The counterweight rope was also wrapped on the drum in the remaining grooves, then threaded over the headframe, down under the counterweight sheave, up over the auxiliary sheave at the collar elevation, and then to the winch hoist which acted as rope storage. The counterweight moved only one-half the distance of the cage travel and since we had 155 ft of shaft and caisson, the closest the counterweight ever came to the bottom was 77½ ft. The counterweight was necessarily about twice the weight of the cage and rode the runners in the rock skip compartment. As shaft sinking progressed, it was only necessary to feed more rope from the winch drum storage to the counterweight.

The new engine house is 206 ft long, 62 ft wide, and 48 ft high from basement floor to ceiling level. Foundations are concrete and walls are composed of face brick, 1-in. insulation and backed by 8-in. concrete blocks. The steel framework supports a 40-ton crane runway.

The cage hoist is a double drum, single clutched, cylinder type hoist with drums 12 ft in dia and 7 ft 6 in. wide. Drums are helically grooved for 1⅞-in. rope and will wind 3300 ft of rope in two layers. Each drum is equipped with a 13-ft dia, 19-in. face, parallel-motion, post-type brake operated hydraulically with 300 psi fluid pressure. Each drum has its own Lilly controller which will prevent overspeed, over travel, and will warn the operator when to commence retarding the hoist at the top or bottom of the shaft. It will also set the brakes in case of power failure. This hoist is powered with a 1000-hp, dc motor through a single-reduction herringbone gear and will wind the hoist rope at a maximum speed of 1500 fpm.

The power source for this hoist motor is a 750-kw, 900-rpm generator driven by a 1100-hp, 2300-v. synchronous motor.

The ore hoist is a duplicate of the cage hoist excepting the motor drives, This hoist is driven by two 1000-hp, dc motors through two single reduction herringbone gears and will wind the hoist rope at a maximum speed of 1800 fpm.

Power Peak Elimination

The power source for the ore hoist is two 750-kw generators in line with a 1750-hp, 2300-v wound rotor induction motor and a 53-ton, 9-ft dia flywheel. This flywheel is rated at approximately 197,000-hp sec and is designed to eliminate excessive power peaks which would otherwise occur.

Compressed air equipment consists of two 3000-cfm compressors feeding to one double size aftercooler. Intake for both compressors is through an oil screen type filter outside the engine house. Cooling water for this equipment is on a closed circuit to a louvered cooling tower. The warm water is sprayed inside the tower, and air is forced through the water spray by means of a propeller mounted at the top of the tower.

A bank of wet cell batteries on continuous charge is maintained to operate motorized circuit controls in case of power failure or low voltage interruptions.

Because of objectionable noise, both the large mg sets, the smaller exciter sets, the accumulator and hydraulic pumps together with the aftercooler,

slip regulator, and water circulation pumps are installed in the basement. The control panels, both hoists, both compressors and the toilet, showers, and locker room are installed on the main floor.

The equipment garage has five large stalls to receive heavy equipment such as tractors or large earth-moving equipment and three smaller stalls for smaller mobile equipment. It contains a 5-ton traveling crane, has toilet facilities, and a partial basement with hatchway for tire and other supply storage. One end of the equipment garage is divided into two fireproof rooms for oil and paint storage.

The main building is U-shaped, each side of the U 221 ft 6 in. long by 61 ft 6 in. wide. The base of the U is 60 ft long by 40 ft wide. The office, which is 40 ft by 60 ft, protrudes downward from the base.

Comfort for Miners

West wing of the building contains the heating plant, lamp room, foreman's check station, mine captain's change rooms, mine foremen's change room, mine-rescue station, miner's street clothes room and miner's mine clothes room. Showers, toilet facilities, laundry, janitor's room and washroom are located between the mine clothes side and miner's street clothes room.

The heating plant has two steam boilers each having a capacity to service the entire surface plant. Coal is taken from bottom-dump cars and elevated into twin bins. Each boiler is fed by a bin feed stoker at the rear of the boiler. Ashes and clinkers are removed from the front of the boiler and dropped into a worm slot which moves the material onto a drag conveyor elevating to the ash bin.

The east wing of the building contains the master mechanic's office, warehouse, carpenter shop, electric shop, baking oven, steam and sand blast room, main shop room, blacksmith shop, and rock drill steel forging and tempering shop. A warehouse basement, 100 ft long and 60 ft wide, under the warehouse, carpenter shop and electric shop, is connected to the shaft by a tunnel and provides storage for heavy mining equipment, Two hatchways into the tunnel are provided for access to the drill shop and main machine shop room. Equipment needing repair can be brought from underground through the tunnel and elevated by either of two power cranes to the shop floor.

A flight of stairs from near the lamp room gives access to the main tunnel extending to the shaft. A timber yard will have a hatchway into a supply tunnel, which also connects to the shaft, for timber supply. Tunnels between the equipment garage and engine house and between engine house and main building contain steam lines, water lines, air lines, return condensate, some sewer lines, and all power cables.

Filled Granby-type 120-cu ft ore cars will be trammed to the hoisting station by 12-ton electric locomotives and dumped with pneumatically operated overhead cylinders on an apron feeder. The ore then is spilled onto a vibrating bar grizzly which passes the oversize (plus 3½ in.) to a 30 x 42-in. jaw crusher set at 3½ to 4 in. discharge. The ore falls to a storage pocket and is admitted to measuring pockets for skip loading. The loaded Kimberly type 250-cu ft skips dump into the surface pocket under which is a 48 in. x 16 ft 9 in. apron feeder which feeds a 30-in. conveyor belt. The conveyor belt dumps into a large hopper above stockpile elevation. During the winter months, this hopper discharges into Dumptor type diesel trucks for stockpiling. During shipping season, ore from the hopper falls directly through to the large railroad storage bins that load the ore cars for shipment to dock.

Dumptors Service Stockpile

Dumptor type truck requires a short permanent steel trestle and a steel ramp. Thereafter, the Dumptor makes and runs on its own stockpile. No further trestle is needed and any size or shape of stockpile can be made. The runways on top of the pile are graded occasionally with a dozer to protect tires and enable faster driving.

The present quantity of water being pumped from underground is approximately 2820 gpm. Some future increase is to be expected and the primary pump station located on the sixth level has capacity of 4500 gpm with room enough in the pump station and a foundation provided for an additional 1500-gal pump, making a total capacity of 6000 gpm.

Two higher level sumps of 190,000 gal each provide settling space as well as positive head for the pump suctions. Suctions for the pumps can be shifted to one or the other sump so that sediments can be cleaned out of the sumps as required.

Each of the three centrifugal pumps is stainless steel, four-stage, 1500 gpm, good for 850-ft head and powered by 1750-rpm, 450-hp motors. The pumps will run automatically with high and low water electrode type controls. Pump discharge is composed of two 14-in. water columns in the shaft which will discharge into a large settling pond on surface to further clarify the mine water before flowing into local streams.

The pumping system below the sixth level elevation will consist of stainless steel deep-well type pumps and will discharge to the sixth level sumps for relay to surface. Settling sumps ahead of the deep-well pumps will be provided and will assist materially in the life of the pump.

This mine is scheduled for limited production starting early in 1955 and gradually increasing to expected production in 1957. It may be stated that our hoisting capacity is greater than the mine capacity considering present known ore areas; however, with future exploration and anticipated larger working areas, production capacity on a normal five-day week, two-shift basis, could be well over 1-million tons per year.

Value of Pilot Drill Hole

The diamond drill hole extending from the shaft bottom to sixth level proved to be of great value. There was much discussion as to the possibility of plugging the hole when blasting or mucking. Actually, the hole was plugged every time we shot a shaft round and remained plugged until all muck was removed. We then opened it up by one of several methods described here and listed in the order of success obtained.

(1) Compressed-air blow pipe lowered to the point where the pipe was plugged.

(2) Extension drill rods used with a jackhammer.

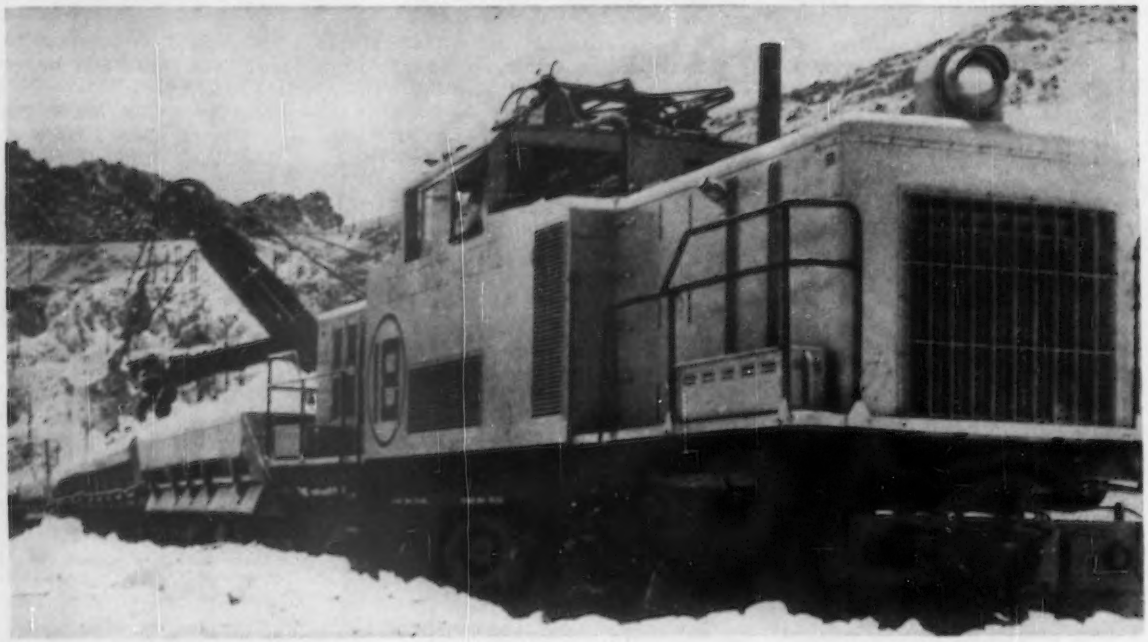
(3) A tight fitting plunger inserted in the water-filled drill hole casing which was struck a sharp blow with a 12-lb hammer.

(4) Charging and blasting the water-filled pipe with several sticks of dynamite.

(5) Shooting up the hole from the sixth level elevation with a 30-30 rifle.

With the water draining down the hole, we were able to drill, charge up, set steel, concrete or any other work without using sump pumps.

We wish to acknowledge the work and helpful suggestions of R. S. Walker, consulting engineer of Cleveland, and S. E. Quayle, manager of mines, Michigan District. We also wish to express our appreciation for the work of all the engineering departments and especially that of Carl Anderson of the electrical department and W. W. Jamar of the mechanical department.



AIR BRAKES AND DYNAMIC BRAKING are used in combination to regulate safe run of 125-ton trolley-diesel locomotives pulling eight 40-yd loaded ore cars down 4% grades at the Morenci open-pit of Phelps-Dodge Corp. in Arizona.

How Dynamic Braking Operates At Carlsbad and Morenci Mines

This article prepared by Messrs. A. B. Chafetz, R. D. Call, Felix Berra, and B. E. Rector, concludes a series of two discussing and analyzing mine locomotive braking systems. The first appeared in E&MJ, December 1954.

INTERNATIONAL MINERALS & CHEMICAL CORP. had a severe braking problem in the 12-North section of the potash mine at Carlsbad, N. M. The haulage system included a 3000-ft section with an average grade of 6% with a maximum grade of 7.81% for approximately 400 ft. (See Fig. 1) At the bottom of the grade it was necessary to establish a 90-deg turn. The grade was with the loaded train and production requirements made it necessary to run 12-car trains downgrade. Braking speeds downgrade had to be held low enough to permit a train to make the 90-deg turn at the bottom of the grade safely.

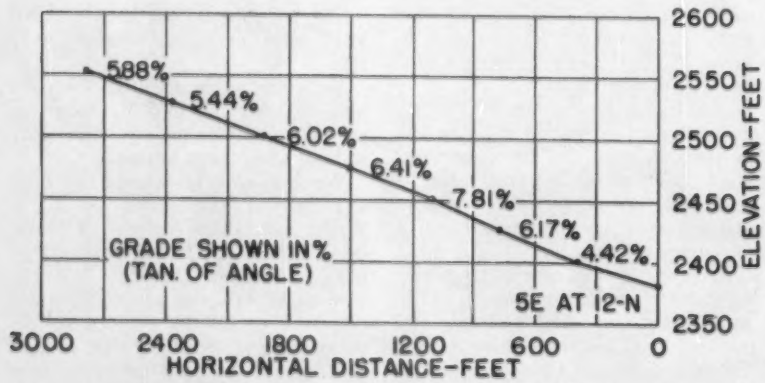


FIG. 1. STEEP GRADES SUCH AS THIS show why IM&C had to install dynamic braking to control speed of loaded trains down haulage level of Carlsbad operations.

It was decided to use existing locomotives at the mine, and supplement the locomotive tread brakes with slider shoes placed under the wheels of the last two cars of the train. These shoes slide against the rail and produce a braking effort. The shoes are placed underneath the car wheels at the top of the grade and then removed at the bottom of the grade. This braking effort augmented the effort of the tread brakes on the locomotives. Two 20-ton locomotives in tandem were used.

Since the slider shoes wore rapidly, the replacement cost of shoes and the resulting rail wear and necessary labor for placing and removing the shoes at the grade terminals were expensive items. Table 1 lists expenditures involved for the fiscal years from 1948 to 1951. The low figure for 1949-1951 was due to an extended strike at the potash mines. For the fiscal year of 1950-1951, 75% of the total produc-

DYNAMIC BRAKING is automatically applied at Carlsbad mine by trackside tripping ramp which actuates limit switches shown in circuit diagram on next page.

tion came from the 12-North area. Since all the ore out of the 12-North area had to be transported down the grade, expenditures for slider shoes increased. This made it desirable to use other means of safely controlling the trains downgrade. The following methods were considered.

(A) Apply manually-controlled dynamic braking equipment to the locomotives and use a storage battery as source of control power so that the operator would have complete control of the dynamic brake even with a loss of trolley power.

(B) Take control of locomotives on the grade out of the hands of the operator by automatically throwing the locomotive into dynamic braking and thereby hold locomotives at a safe speed on the grade by a selective current-limit braking relay.

(C) Apply air brakes to two cars and use these cars only as braking cars to supplement braking effort of locomotives.

(D) Apply magnetic track shoe brakes on the locomotives to increase the braking effort of the locomotives.

Of the schemes considered, a combination of **(A)** and **(B)** was recommended. By using this scheme of automatic selective current limit dynamic braking, the locomotives could be kept at a safe speed at all times on the grade to operate well within the limits of the locomotive handling 12 cars with considerable reserve capacity for additional braking under the control of the operator. With two 20-ton locomotives coupled to 12 loaded cars, each car weighing 9 tons loaded, the coefficient of adhesion on clean dry rail at the holding speed of 5 mph on the 6% grade is approximately 20% and on the 7.81% grade is approximately 28%.

Fig. 2 is the main power schematic and Fig. 3 shows the control schematic for the automatic selective current limit system used. Dynamic braking is automatically applied when limit switches 1LS make contact. These limit switches on the locomotive are operated by blocks which project above the rails. These blocks are located at the top entrance to the grade and at the bottom of the grade.

Table 1. Slider shoe costs at potash mine of International Minerals & Chemical Corp.

Fiscal year	Material	Labor	Total
1948-1949	$2,695.00	$2,545.00	$ 5,240.00
1949-1950	913.00	1,220.00	2,133.00
1950-1951	5,705.00	5,427.00	11,132.00

As the locomotive enters the grade, the limit switches will pass over the projecting block, closing contacts of the limit switch. The changeover relay E will operate to open the control circuit to all power switches, disconnecting the motors from the trolley and closing the control circuit to the dynamic braking switches. This causes the motors to be connected for dynamic braking under control of the current limit relay.

Switch Closing Sequence

Dynamic braking switches will close in sequence until the dynamic braking current reaches a value which will open the current limit relay. When the current limit relay contacts open, the progression of closing braking switches is arrested. This value of current is greater than that necessary to hold a fixed speed on the grade, but is less than that which will provide enough braking effort to lock the wheels. Consequently, the locomotive will slow down and the braking current will increase. At the point where the braking current decreases below that current which was necessary to open the current limit relay, the relay will close again and the next braking switch will close.

Closing the braking switch short circuits a section of the braking resistor causing an increase in braking current with a corresponding increase in braking effort. This increase in braking effort causes the locomotive to slow down further and the current decreases to the point where the current limit relay operates again to close the next braking switch. This action continues to a predetermined point where the train speed is considered safe. The locomotive continues down the grade on this braking point until limit switch 2LS contacts the projecting block at the bottom of the grade. Operation of 2LS deenergizes changeover relay E and the locomotive operator can take over control of the locomotive by returning the controller main handle to the "off" position and operating the controller in the regular manner.

The operation of the changeover relay at the top of the grade puts the locomotive into dynamic braking regardless of the position of the controller main drum. If, when operating on the grade, the operator desires to further decrease the speed of the locomotive by means of the dynamic brake, he can do so by moving the controller main drum into a dynamic braking notch past that preset by the changeover relay, but he cannot back off the dynamic brake above the point set by the relay. Thus the maximum speed of the train on the grade is limited by the braking point set up by the changeover relay.

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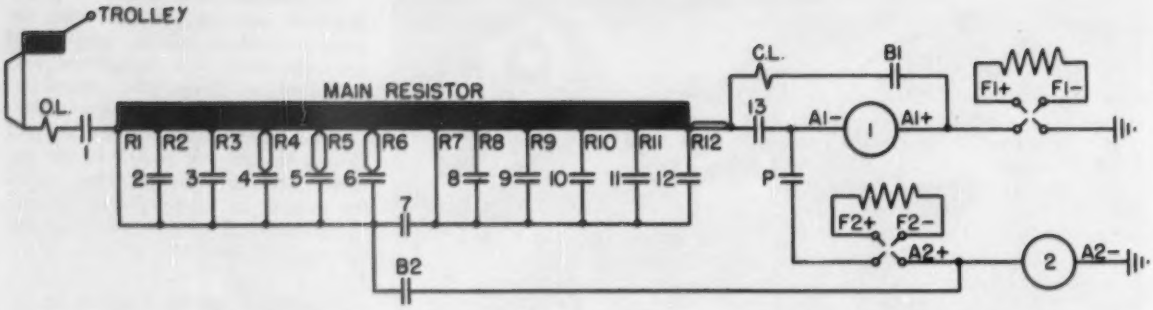
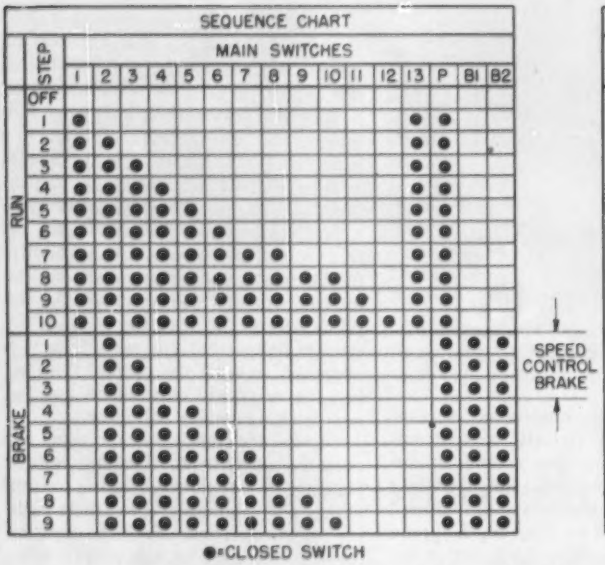



SEQUENCE CHART
MAIN SWITCHES
STEP
1 2 3 4 5 6 7 8 9 10 11 12 13 P B1 B2
RUN
OFF 1 2 3 4 5 6 7 8 9 10
BRAKE
1 2 3 4 5 6 7 8 9
SPEED CONTROL BRAKE
●=CLOSED SWITCH

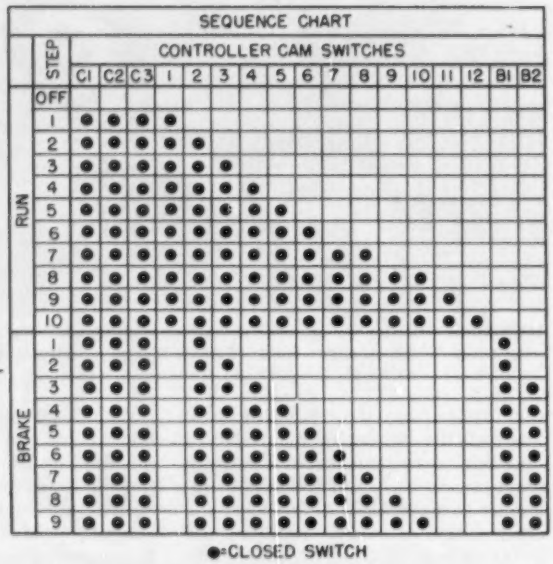

SEQUENCE CHART
CONTROLLER CAM SWITCHES
STEP
C1 C2 C3 1 2 3 4 5 6 7 8 9 10 11 12 B1 B2
RUN
OFF 1 2 3 4 5 6 7 8 9 10
BRAKE
1 2 3 4 5 6 7 8 9
●=CLOSED SWITCH

FIG. 2. MAIN POWER SCHEMATIC for 20-ton electric locomotives at Carlsbad is shown at top. Sequence charts below show how main switches and controller cam switches are closed during the "run" and "brake" phases of the haulage trip.

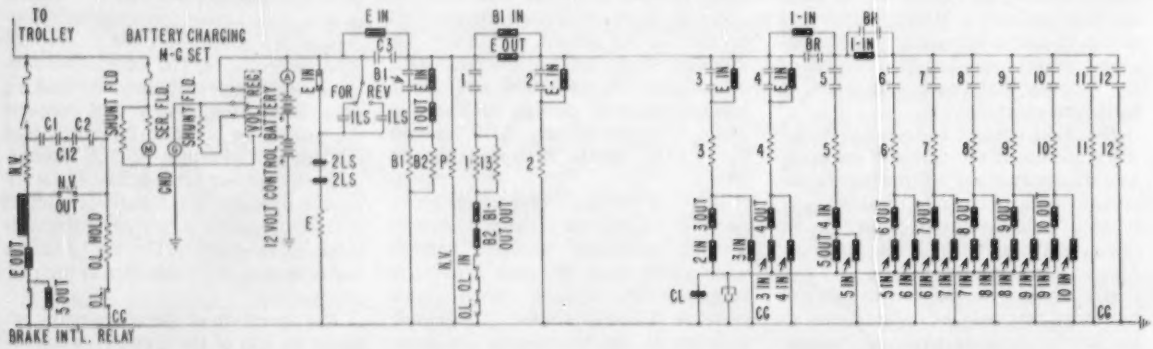


FIG. 3. DYNAMIC BRAKING is automatically applied when limit switch 1LS actuated by railside ramp makes contact. Dynamic braking switches 2 to 10 close in sequence according to the pattern shown in the sequence charts in Fig. 2 above.

As shown in Fig. 3 two 1LS limit switches and a selector switch are used. One switch is mounted on each side of the locomotive. This arrangement permits the locomotive to operate in either forward or reverse direction past the limit switch operating blocks at the top entrance to the grade.

Locomotives at this property have been operating satisfactorily since installation of the automatic selective current limit dynamic braking system. In addition to eliminating the slider shoe costs, maintenance costs in locomotive brake shoes have decreased. Since locomotive tread brakes are no longer required to produce braking while operating down the grade, cost of maintenance on this item has been reduced by 30%.

In addition to current-limit operation while braking, these locomotives also accelerate under supervision of the current limit relay. Movement of the main control handle from the "off" to the "full on" position does not apply line voltage to the motors since the current limit relay prevents closure of the accelerating switches until the current is of the proper magnitude.

Dynamic Braking at Morenci

The type locomotives used in the Morenci open pit mine are of the 125-ton class 0-4-4-0 wheel arrangement.

They are powered by 860-v trolley and diesel auxiliary engines (two of them—one on each end) for traveling on benches and other places where trolley is not provided. Each train is composed of the locomotive and eight 40-yd cars (weight per car, 45 tons) and 85 tons of load per car. Each car is equipped with its own air brake system for working with the train. Locomotives (16 of these) are all equipped with dynamic braking as the grades over which the load must be carried is 4% downhill to the crushing plant.

The dynamic braking system is of the manually controlled current-limiting type and is divided into two groups. The original group of nine locomotives is equipped with overspeed and overvoltage relays limiting speed to 15 mph, and the second group of seven locomotives is equipped with overspeed and current-limit relays limiting the speed to 18 mph.

On the first nine locomotives, the dynamic braking must be used only on speeds of 15 mph or less in conjunction with air brakes to hold the trains on the 4% grades.

The dynamic brake controller has six notches for providing increasing amounts of braking—each notch being limited to 400 amp. An overspeed relay is provided—procuring its operating voltage from a spotting resistor—to prevent setting the dynamic brake at speeds in excess of 15 mph by holding the circuits inoperative. An overvoltage relay is provided across the armature of a motor for introducing additional resistance into the braking circuits of the motors if the voltage across the armature exceeds a predetermined voltage setting of units in the circuit.

On the second group of locomotives, the main braking circuit is essentially the same as the first group of locomotives, except that braking is obtained at higher speed—18 mph. Here, also, the dynamic brake must be used in conjunction with the air brakes. The same overspeed relay is provided so as to prevent the setting of dynamic braking at speeds in excess of 18 mph and hold the circuits inoperative. Current-limit relays are provided for automatic control of braking load at the will of the operator. Control depends on the action of these relays and associated interlocks for automatic progression and retrogression. The braking circuits will impose increasing load by steps until a predetermined setting is reached, and if it goes beyond that, the steps will retrogress to the correct brake setting. If the braking controller is set on a lower notch, the progression cannot proceed as far as on the higher notches and the dynamic braking effect will be less.

In this operation, dynamic braking has proven itself successful and the engineers use it effectively in bringing the trains down the 4% grade at safe speeds. Straight air on the train must also be used in conjunction with the dynamic braking. Maximum currents for various speed settings can easily bring a train down the grade on dynamic braking alone—only this is not advisable.

Dynamic braking applied with air braking has always made for safe operating conditions and good control of the trains because the speeds are kept low. Operation of the braking circuit by the engineers is very simple. The master controller is simply set in the zero position and then the braking controller in the desired notch and the motor amperage is held below 400 amp by adjustment of the straight air brake.

Dynamic braking on these locomotives has always been trouble-free. The only trouble that has been experienced in the past is the burning of the spotting resistance, which becomes distorted from constant heating and shorts out. Engineers, at times, tend to coast downhill with the master controller in the off position and the voltage builds up across the resistor.

Conclusions

Braking conditions in mine haulage systems, particularly in underground mining, are more severe than in any other branch of the traction industry. Grade and track conditions are extremely variable and in many cases the cars have no power brake equipment and it is necessary for the locomotive to perform all braking duty. In open-pit haulage systems, long grades are usually encountered and even though power brake equipment is used on the cars, the use of the electric regenerative or dynamic braking on the locomotive reduces the braking duty required of the car brakes, resulting in increased brake shoe and wheel life.

Modification and refinements of the dynamic braking control system make possible a wider use of this system on mining type locomotives. As a result, safer and more economical operation of mine haulage systems is readily achieved.

How Two Synchronous Motors Saved $500 per Month

MOTORS WERE INSTALLED to drive two tailings pumps in this wash plant.

INSTALLATION of two 600-hp synchronous motors in the power system serving four iron ore concentration plants on the Iron Range raised the power factor of the system from a low of 80% to an 86% level, thereby eliminating a power factor penalty which amounted to $500 per month. Penalty limit was 85%.

The units consisted of two 600-hp, 60-cyc, 2300-v, 600 rpm Fairbanks-Morse synchronous motors with 80% leading power factor, driving 12-in. Hydroseal centrifugal pumps handling waste tailings (25% solids) through 7,700 ft of 18-in. pipe leading to the company's huge tailings basin. Normally the pumps handle 446,400 gph, the solids amounting to more than 450 long tons per hour. Static lift for the discharge line is 76 ft.

600-HP SYNCHRONOUS MOTORS which raised power factor and cut costs.

How Should an Operator Negotiate for a Property . . .

Participation or Lease?

Acquisitions of mineral properties, on the Colorado Plateau and elsewhere, are increasing daily. In each case, the biggest stumbling block is the divergence of purchase price evaluation between property owner and operator. *E&MJ* here offers an authoritative analysis of the methods of evaluation and negotiation required to help the buyer and seller get together.

WILLIAM F. BOERICKE
Hayden-Stone & Co.

WHEN FINANCIAL AID IS SOUGHT for developing and equipping a mining property upon which the presence of ore has already been established although perhaps not yet definitely determined in amount, a variety of arrangements is possible between the owner and the parties putting up the funds.

These may be broadly divided into three basic patterns.

Simplest but least likely to be used is outright sale. This procedure could take place when it was possible to establish a price that was agreeable to both parties and did not involve a large sum. The difficulties are obvious, as appraisal of a semideveloped mine can never be precise, and opinion of buyer and seller will usually vary widely. More likely is the payment of regular stipulated amounts with option to purchase at an agreed price, and payments to be applied against the purchase. Or briefly, the vendor gives an option to purchase for a definite time in consideration of regular payments made in the interim. If the option is not exercised at the time it has expired, all prior payments belong to the vendor.

Lease and Bond

A variety of this is the time-honored "lease and bond", whereby the vendor receives a royalty when the property is brought into production that is based on value of ore. Such royalty payments accrue as a credit toward purchase at an agreed price if the operator wants to acquire the property for ownership. If the price is arbitrarily set so high that purchase is unlikely, to all practical intent this arrangement becomes a straight lease on a royalty basis.

When outright purchase is not contemplated through inability to agree upon a price, the owner can consider outright leasing, or participation in profits. In both cases the owner must be willing to give up management control of his property, although he may protect himself by provisions for minimum capital expenditures, minimum production, and other stipulations.

It frequently becomes a difficult matter to determine the best deal, to lease or participate in profits, providing of course that a choice is offered. In its simplest form a straight lease provides for a set royalty rate on net smelter returns. Administration is easy and there is little chance for dispute as lease payments are ordinarily made to the lessor directly by the ore buyer or smelter. However, in case of a sudden change in the character of the final product, such as an increase in concentrate grade, a set royalty rate may become inequitable. For example, a 10% royalty might be considered reasonable for a $10 gold ore, with average $6 costs. This would leave the lessor with 25% of the operating profit and the operator with 75% after paying royalty. If the ore should suddenly increase to $20 per ton with costs remaining the same, the lessor would receive $2 or 14.3% of operating profit, while the operator would get 85.7% after royalty. Conversely, if the ore dropped to $7, the lessor and operator would receive 70% and 30% respectively.

Sliding Scale Royalty

To avoid this a sliding scale royalty can be set up, with the royalty rate increasing somewhat in ratio with increase in grade and decreasing when grade declines. On the Colorado Plateau royalties parallel quite closely the grade of the ore produced, and may vary from less than 10% to 25% or higher.

For state-owned land, the State of Utah takes a flat 12½% of gross value of the uranium-vanadium ore as determined by the scale of payments of the AEC. However, with claim owners it appears usual to require 10%-15% with ore of 0.2% U_3O_8 or less ($16 per ton) with 20%-30% when the grade is 0.3%-0.4% ($25.50-$35). A major mining company has reported that 15% is the top that they will consider.

Royalty Stipulation

Twenty years ago, W. O. Vanderberg in Bureau of Mines paper 6774 mentions the following royalty rates for various ore values: 10% for $10 per ton, 15% for $10-$20, 20% for $20-$40, 25% for $40-$100. However, lower royalties are generally stipulated for ores worth less than $10 per ton.

While a time limit is frequently placed on the life of a lease, there is rarely any objection to renewal as long as the work is productive. Short term leases are not sought by responsible operators and usually result in uneconomic exploitation of the ore deposit, with incentive to high-grade the mine and neglect development work. Old-timers will recall the short leases granted on the fabulously rich Mohawk orebody in Goldfield in early days, that resulted in ruthless high-grading and heavy losses to owner and leasers alike.

When a lease is fairly drawn up, there is little excuse for subsequent disputes. Such essentials as minimum royalties, method of working, maintenance of workings, inspection by owner's agents, ownership of property improvements and dumps if lease is terminated should be clearly spelled out. Usual standards of mine safety must be maintained, but state mine inspectors may be relied upon to assure cooperation in that field.

From the owner's standpoint, an advantage of leasing is that he is assured of immediate returns as soon as production begins, regardless of whether operations show a profit to the

leaser—although obviously this won't keep up long unless the operator is a congenital optimist with a substantial bankroll. If instead of leasing, the owner elects to take a participation in the operating profits after the operator recovers his capital expenditures, he is obliged to wait for a considerable time before receiving any returns.

Royalty-Participation

As a compromise between leasing and participation in profits, it may be provided that the owner shall receive a royalty until the property is on a production basis and the operator shall have recovered his capital expenses, and thereafter his royalty shall cease and he will participate in profits on some agreed ratio. This method is illustrated by the arrangement drawn up between American Smelting & Refining Co. and Vulcan Silver-Lead Corp. for exploration and development of the latter's Galena property in the Coeur d'Alenes. A 30-year lease was signed by Vulcan to the smelting company with a 30-year extension privilege, whereby AS&R undertook exploration and development work at its own expense to cost upward of $1-million. Vulcan was to receive $500 per month as advance royalty recoverable out of future earned royalties. With the production of ore, Vulcan would receive a 10% royalty of net smelter returns. After the lessee should have recovered its capital costs and accumulated a working capital of $500,000, then Vulcan would be entitled to 50% of all profits and royalty payments would cease.

Another instance is the agreement between Mesabi Iron Co. and Reserve Mining Co. Under the terms of the lease, Mesabi receives a royalty of 8½c per ton of taconites mined from its property, or 25c per ton of concentrates (about 3:1 concentration ratio). This would approximate only about 2½% royalty. In addition, however, Mesabi is to receive one-third of the operating profits when production begins. It is expected that the latter will greatly exceed the royalty payments and compensate for the low royalty rate. An interesting feature is that capital expenditures by Reserve are not recoverable before profit participation by Mesabi begins.

When the owner has the choice between leasing or profit participation it behooves him to do some close figuring. Certain hypothetical cases are presented to show income under varying conditions for each.

Assume a small gold property that has been developed by the owner to the extent of giving reasonable assurance of an orebody averaging $12 per ton which can be milled at an overall cost of $8 per ton with a 90% recovery at a rate of 100 tons per day. If the property is leased at a 10% royalty, he would receive an annual royalty of $38,800 per year theoretically after production began.

Suppose that the cost of further development for production and mill construction came to $500,000. If the owner elected to accept a 50-50 participation in profits after capital costs had been recovered, he would have to wait 5 years before capital costs had been amortized by the annual profit of $100,800. Thereafter he would receive $50,400 annually, or in tabular form—

	Annual income from royalty	Income from 50-50 participation
First five years of production	$38,800	0
Sixth year and thereafter	38,800	$50,400

At the end of 10 yr of production, the owner would have received $388,000 in royalties but only $252,000 if he had elected participation. Thus leasing would leave the owner better off in this instance.

If the same property cited above was already equipped and ready to produce without further capital expense, participation on a 50-50 basis would be a better deal for the owner than a 10% royalty, by $11,600 per yr.

Consider the same mine, fully equipped and ready for production at 100 tons per day of $20 ore with a 90% recovery. What royalty should be paid to equal a 50-50 participation under varying costs listed in Table I?

Table I: What Royalty Equals 50-50 Participation With Changing Costs?

Daily value of prod.	Costs	Daily profit	50% partici.	Equivalent royalty rate to equal
$1,800	$ 800	$1,000	$ 500	27.7%
	1,000	800	400	22.2
	1,200	600	300	16.6
	1,400	400	200	11.1
	1,600	200	100	5.5

Table II — With Varying Grade?

Recoverable value of ore	Daily value of production	Daily profit	50–50 division	Equivalent royalty rate
$15	$1,500	$ 500	$ 250	16%
20	2,000	1,000	500	25
25	2,500	1,500	750	30
30	3,000	2,000	1,000	33
35	3,500	2,500	1,250	35.7

Table III: How About Straight Royalty?

Daily tons milled	Recoverable value per ton	Gross value of prod	Costs per ton	Net profit	50–50 partici.	10% royalty	Operator's profit after royalty
50	$15	$ 750	$12	$150	$ 75	$ 75	$ 75
100	13	1,300	11	200	100	130	70
150	12	1,800	10	300	150	180	120
200	11	2,200	9	400	200	220	180

Varying Grade

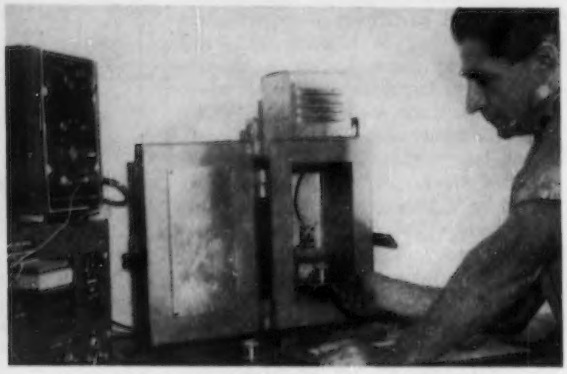
The next example (see Table II) assumes production at 100 tons per day, of ore varying recoverable grade, but in each instance costs are assumed at an unvarying $10 per ton. What should the royalty rate be to equal 50-50 profit participation?

As a practical matter, what usually happens is that ore of a lower average value per ton is milled as tonnage is increased with resulting lower per ton costs and management endeavoring to lengthen the life of the mine by lowering the cut-off point. In this case a straight royalty may return more to the owner than a profit participation. An example of this appears in the next Table III.

Heavy royalty payments might be lightened by a lower rate of royalty as grade of ore declined. The owner would realize that his aggregate royalties might be larger at a lower rate because of an extended life for the mine.

COSTEANING ALONG a "line of interest," this bulldozer will be followed by teams with geiger counters and scintillometers.

DIAMOND DRILL bites through thick overburden near Rum Jungle mine site. Final size and worth of orebody still unknown.



ORE SAMPLE is tested and examined by lab technician. Scaler indicates degree of radioactivity. Note lead casing.

Rum Jungle Begins Production

T. A. G. HUNGERFORD*

Photographs by
Neil Murray

RUM JUNGLE, Australia's massive uranium orebody 54 mi south of Darwin, N. T., came of age in mid-September with the production of the first ton of U_3O_8 concentrate produced at the site.

At the opening ceremony, Prime Minister Robert G. Menzies paid tribute to the scientists, engineers and miners responsible for the project. Alongside the dais from which he spoke, a Hough Payloader stood ready with the first ton of ore. Mr. Menzies pressed a button, a siren screamed and the Payloader roared into action, sending the ore cascading into the crusher.

The grey ore is emptied into the crushers, carried by a conveyor belt over screens. Undersize is carried by conveyor belt to fine ore bins and oversize to a Symons cone crusher for further treatment. Ore is wet ground in the ball mill, slimes being passed to the pachucas via a Dorr thickener. In the pachucas, the largest rubber-lined tanks in Australia, the uranium is taken into solution by sulphuric acid, after which Oliver filters separate the uranium solution from the pulp.

Rum Jungle's amazing growth dates from 1949, when Jack White, veteran Northern Territory prospector, revealed its importance. White recognized the similarity between illustrations in a Government Bureau of Mineral Resources bulletin and the ores he had seen lying around the old copper workings at Rum Jungle. Specimens were sent to the Department of Mines and found radioactive. White was later awarded $60,000 for the find.

Inspection by experts was begun, continuing after the wet season in 1950. Despite discouraging early results, two shafts were sunk to 100 ft. A crosscut entered ore at 22 ft from one shaft and continued in high grade ore. Exploration for two years, carried on in spite of Australia's three bogeys; heat, distance and "the wet," eventually proved up a large orebody.

Missions sent from Great Britain and the U. S. cooperated in the study and eventually helped in the formation of an agreement for the development of the Rum Jungle field, executed on behalf of the Australian government in January 1953. Parties are Australia and the Combined Development Agency, joint agency of Britain and U. S.

Under the agreement, the agency is pledged to advance the capital and provide technical assistance for the project and Australia agrees to sell to the agency, at a satisfactory price and under conditions which fully guarantee Australia's interests, the project output for an agreed period.

The Australian government turned to several great mining companies for the actual creation of the undertaking. Territory Enterprises Pty. Ltd., a wholly-owned subsidiary formed by

* Courtesy of the Australian News and Information Bureau, New York, N. Y.

NEW RIVERBED is dug for Finnis River, which overflows projected open-pit area during the "wet." Flood levels were studied.

RUBBER-LINED PACHUCAS, biggest in Australia, take uranium into solution. Headframe marks White's Mine.

CONSOLIDATED ZINC PTY. treatment plant makes the concentrate. Firm receives only management fee.

Of Uranium Oxide Concentrate

Consolidated Zinc Pty. Ltd., accepted the challenge to represent the parent organization. The company began operations in January 1953, receiving only a management fee.

Development work continues. Dyson's Mine, discovered in 1950 by D. F. Dyson, Bureau geophysicist, has yielded large tonnages by open-pit methods. The main shaft at White's Mine was sunk to 500 ft and a large stockpile accumulated. A channel 2,000 ft long by 100 ft wide and 30 ft deep, for the diversion of the Finnis River, is nearly completed and a total of 15,000 ft of exploratory costeaning has been carried out in the area surrounding the plant at Batchelor.

Since a couple of feet of overburden is sufficient to mask radioactivity, bulldozers must work along a "line of interest"—a bed of slate which extends for miles. Geophysical exploration is carried on along the cleared channel.

White's Mine, the original shaft, is now being extended for exploratory purposes only. Ground proved bad, soft and wet, requiring heavy timbering, and operators decided to change to open-pit methods. Because the orebody lies at an angle, overburden will be removed from around it, leaving a column of uranium-bearing ore.

On the other side of the plant site from White's, Dyson's Mine is a purely "open-cut show." It was discovered during exploration for another shaft. High-grade was uncovered originally by hand trenching. Soft rock permits the dozers to carve out the ore and push it over a loading ramp into waiting trucks.

Rum Jungle is close to a major airfield, the RAAF wartime base at Batchelor. A railway line connects it with the deep-water port of Darwin, 54 mi north, and with Birdum, about 300 mi south. A first class highway connects it with Darwin and Alice Springs, central Australia, and thence by rail to Adelaide. Abundant water is available from nearby Crater Lake.

The whole of Rum Jungle is contained within the Hundred of Goyder, a strip of country 12 mi long and 14 mi wide. At the mine itself, the thick bush, like a limitless green sea, washes right up to the edge of the dusty red clearing with its huge, gray, galvanized buildings.

All around the treatment plant are clustered the laboratories, workshops, diesel power installations and the administrative buildings necessary to the project's existence. Trucks, jeeps and Landrovers weave ceaselessly among them, each towing its own plume of red dust.

Batchelor, begun in 1952, now has a population of 700, served by a store, snack-bar, theater, ladies' lounge and men's bar. The school is small but well appointed. A sports oval, flood-lit swimming pool, 9-hole golf course and day and night tennis courts are under construction. A prefabricated stage has already seen three productions and church services are conducted in the Roman Catholic church of St. Barbara and in the Australian Inland Mission Hut. A hospital is being built and the town's several miles of surrounding roads are being bitumen-surfaced.

KARL JASPER, (right), NWMA president, checks with A. E. Weissenborn, uranium session chairman.

ROBERT J. TOWNE, NWMA secretary, arranged meetings, aided by Mrs. Amy Satterstrom, asst. secretary, and Mrs. Dorothy Osborn.

Cheerfulness Pervades Meeting Of

DRILLING PROBLEMS engrossed R. L. Olund (left) I-R manager, Butte, Charles Rushton, Northwest Improvement Co., George R. Powe, chief geologist, Northern Pacific Ry., Arthur Wallgren, also of Northwest Improvement Co.

ALL HANDS welcomed Stanly A. Easton, for many years president of Bunker Hill & Sullivan at Kellogg.

GOOD STORY told by L. M. Kinney (center), Pend Oreille Mines & Metals, amuses R. R. McNaughton (left) and B. F. Hurdle, both of Consolidated Mining & Smelting Co., B. C.

EARLY ARRIVALS, Mr. and Mrs. P. C. Fedderson, general manager, Bunker Hill & Sullivan, chide late-comer Donald F. Ingvolstad, metallurgist, also from Bunker Hill at Kellogg.

FRANK MARR, (right), program chairman and former NWMA president, chats with Joe Kieffer, AS&R Co., Wallace.

CANADA was ably represented by Dr. G. C. Monture Dept. of Mines. Ottawa, (left) George E. Cole, past president CIMM.

Northwest Mining Association

WITH CHARACTERISTIC MINER'S OPTIMISM, the nearly 600 registrants at the 60th Annual convention of the Northwest Mining Association, held in Spokane, Wash., Dec. 3 and 4, talked earnestly of a better future for mining. One heard few complaints about the past.

In the uranium session, L. D. Jarrard, chief, Butte office, exploration branch, AEC, reported that private enterprise has done four or five times as much as government in exploration for, and discovery of, uranium orebodies. A self-sustaining uranium mining industry has been created in less than 7 years, he pointed out.

Elton A. Youngberg, director of the mining division, Grand Junction operations office, AEC, reported that Plateau uranium exploration, construction, and mining now represents a $100-million industry annually.

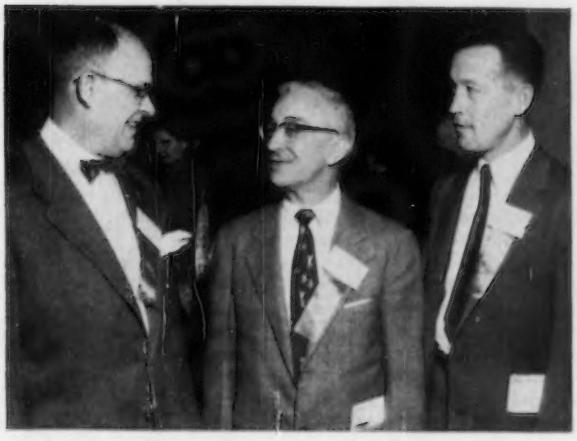
Youngberg gave AEC estimates that the first power from uranium would be commercially available before 1960, but that by 1975 about 17,000 tons of contained U_3O_8 would be required annually to supply the needs of the world's uranium-based power plants.

Frank Armstrong, USGS, reviewed uranium occurrences in the Northwest and suggested the northern Cascades and central and eastern Montana as likely spots to prospect for uranium.

George Becraft and Darrel Pinckney, USGS, described uranium in the Boulder batholith in Montana. Contrary to what one might expect, uranium occurs in only minor amounts near Butte, but is associated in mineable quantities with siliceous veins near Bolder, Clancy, and Basin Creek.

Paul Weiss, USGS, described geiger and scintillation counters, and demonstrated how a thin layer of earth could mask a uranium vein. He also showed why geiger counter cannot give a reliable assay of a uranium ore except under carefully controlled conditions.

Miles P. Romney, manager Utah Mining Association, called for all mining men to aid mining's public relations by explaining to friends and neighbors mining's special problem as a wasting asset industry. Mr. Romney outlined his association's efforts to bring a better understanding of Utah's mining industry to school teachers,



UNCONVINCED are Wayne Gould (right), Sunshine Mining Co., and Wallace Woolf (center), Sullivan Mining Co., as Roy McFarland, Ingersoll-Rand, Wallace tells new story.

FOOTBALL, not mining, held attention of A. W. Shaeffer (left) Lehigh Portland Cement Co., Robert E. Sorenson, Hecla Mining Co., and W. M. Irwin, Colorado Fuel & Iron.

QUIET CHAT is enjoyed by W. L. Zeigler (left), and Jens Jensen, both Pend Oreille Mines & Metals, Metaline Falls.

CHECKING IN are Ross Leisk (right), general manager Sunshine Mining Co., and Robert M. Hardy, Jr., assistant.

ABOUT TO REGISTER are: (from left) Mrs. L. R. Randall, Mrs. J. K. Matthews, Mrs. Ted Young, and Mrs. A. Peterson, all from Hecla Mining Co., Wallace.

children, and libraries in his state.

R. H. Ramsey, editor of *Engineering and Mining Journal*, in estimating the outlook for base metals, saw copper in an excellent position, lead only a little less so, and zinc as facing an uneasy price situation held in balance by government stockpiling.

Demand for metals in 1955 should be firm, he said, owing to the prospect for increased activity in general business as compared with 1954. Surplus stocks of zinc, however, are likely to be disposed of only through government stockpiling. The present program, scheduled to end June 30, 1955, may well continue after that, he reported.

In the operating sessions, R. N. Breckenridge, Sunshine Mining Co., reported operating advantages with use of light air-leg drills and small diameter bits on alloy steel rods. Total cost for 1953 at Sunshine with small bits was 9.6c per ton mined for bits and 8.4c per ton for steel.

Paul Floyd, also of Sunshine Mining Co., described a separation of freibergite (copper - silver - antimony sulphide) from galena by using sodium sulphide, zinc sulphate, and careful control. A silver-bearing and an arsenic-bearing pyrite are then separated in another flotation circuit.

Dr. J. D. Forester, Dean of the School of Mines, Idaho University, told how raw fuel resources might be vastly increased by using low grade coal or oil reserves. Small-scale tests, using methods he outlined, have demonstrated the feasibility of the electrocarbonization technique.

Tom Pittman, chief engineer, Knob Hill Mines, described his company's experience with cut-and-fill plus sandfilling. Circular ore passes and compressed air locomotives are interesting new features of the mine.

H. H. Shook described the Morning mine's work in mining sill pillars and caved ground. Basket sets proved of importance. Ray Larson, of Du Pont, described recent advances in industrial explosives.

Manning W. Cox, chief geologist Northwest Mining Department, AS&R Co., read J. E. Berg's description of development of the Galena Unit of AS&R, otherwise known as the Vulcan mine. Eight years of difficult development work have outlined substantial zones of lead-silver mineralization.

The lead zone along the south wall of the Galena fault in Lake Gulch west of Wallace contains several veins, at least two of which will be mineable over a developed length of about 1500 ft.

The silver zone, to the southeast, contains several siderite veins carrying argentiferous tetrahedrite with a silver-copper ratio of about 20 to 1.

The property is of interest because of the discovery of major quantities of silver, lead, and copper mineralization in "blind" oreshoots at depths up to 4000 ft below the surface.

Leasing Opposed

Resolutions adopted by the convention-goers included a plea for a legislation providing an excise tax to supplement present tariffs on lead and zinc imports. Import quotas were suggested as an alternative.

The group also termed stockpiling as a stop-gap measure, not to be relied on indefinitely as an industry aid.

The present mining laws were backed by the Association, although the group favored such modification as needed to give free play to geophysical prospecting. Extension of government leasing or royalty systems was opposed.

Officers elected are: Karl W. Jasper, president; Robert E. Sorenson, vice-president; P. Evan Oscarson, vice-president; Robert J. Towne, secretary; E. K. Barnes, treasurer.

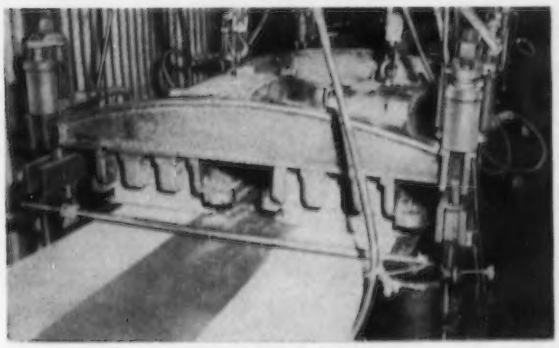
OPERATING IDEAS

Lift truck picks up sand . . . . drops it into hopper . . . . which crane trausfers to bin.

Lift Truck Cuts Down Car Unloading Time

THE TIME REQUIRED TO UNLOAD white sand from rail cars is cut at the Electric Steel Foundry Co. plant, Portland, Ore., where two specially-fabricated steel hoppers are loaded by a maneuverable Hyster No. 20 lift truck fitted with a scoop attachment for picking up sand inside of the car.

Previously it took four men three hours to unload a car of sand using old buckets. Now four men work about one-half hour until the doorway is clear of sand. Then two men finish up the job in about one hour. This is accomplished by placing one hopper on each side of the car. While one is being removed to the storage bin, the other is being unloaded with the special scoop lift attachment illustrated. The boxes are self dumping—a real safety feature. The crane operator simply lowers the hopper into a bin, and trips a lever which releases the sand load.



FOUR HYDRAULIC RAMS are installed on the platen to maintain even pressure on corners during belt vulcanizing.

USE OF THESE RAMS cut down cost of vulcanizing conveyor belts from approximately $3.90 per ft to $1.80 per ft.

How to Use a Hydraulic Ram to Repair a Conveyor Belt

IN ONE OF THE LARGEST IRON MINES in the world, where conveyor belts are miles long (one of them is 3 mi long) and cost millions of dollars, belt repair is a constantly recurring job. In fact one mine has a special building expressly for use in renewing conveyor belt surfaces.

Resourceful engineers responsible for these operations hit upon a new and ingenious method for holding pressure on the vulcanizing platen. They installed a 30-ton center-hole hydraulic ram at each corner of the platen to maintain even pressure until the vulcanizing operation is completed. Two vulcanizing platens with four rams to each are in operation throughout the winter season when actual mining operations are suspended. Four rams are hooked up in series to one pump to equalize pressures applied simultaneously at each ram.

Until these rams were installed vulcanizing costs were about $3.90 per ft. Installation of the new system cut this cost to $1.80 per ft. The hydraulic rams were supplied by the Owatonna Tool Co., Owatonna, Minn.

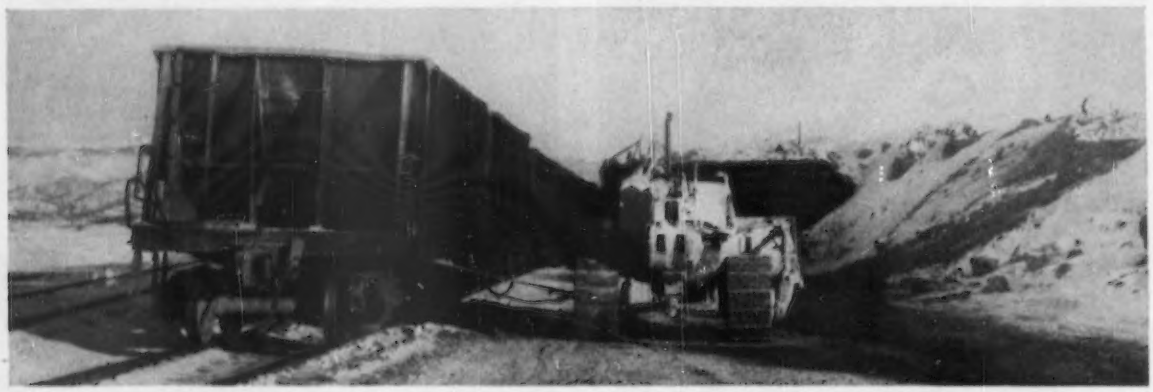
Miners install tier of concrete blocks on base of millhole.

What you see when you look down an incomplete millhole.

Concrete Block Millholes

LEN SPEAR, Mine Foreman of Hollinger Consolidated Gold Mines, Inc., describes the following interesting experimental trial of concrete-block millhole construction to replace conventional timbered millholes. As shown in the accompanying photographs, the millholes are built up in tiers. Blocks measure 12 in. long, by 8 in. wide by 8 in. high. Tongue-and-groove design holds the blocks firmly in place. Each concrete block is cast with a hole extending from top to bottom, through which short lengths of pipe are inserted to lock adjacent tiers of blocks together. Note in the photograph above that the steel pipe is inserted to extend several inches into the block, and an equal distance above. The holes are positioned to permit the reversing of blocks in alternate tiers thereby staggering the joints between the blocks. After a tier of blocks has been placed, a chain is looped around the perimeter and drawn up with a "bear-trap" or come-along. This closes up the joints tightly. It is too early to report fully on the success of this experimental technique. *E&MJ* is indebted to the *HOLLINGER MINER* for this operating idea and for the photographs shown.

Note how blocks are staggered by reversing tongues.



Diesel-Powered Tractor Serves as Mine-Car Spotter

VERSATILITY OF A TRACTOR is shown in the above illustration where a Caterpillar Diesel-powered D8 is pulling a string of railroad cars into position for loading. This unique use of a tractor was made at a copper mine near Kimberly, Nevada, where Isbell Construction Co. carried out a major construction contract. Tractor is still available for other duties in the loading area. Photo courtesy Caterpillar Tractor Co.

STEEL...one piece or a truckload

Delivered where you want it . . . . when you want it

Sure we like big orders—and we handle them easily, every day, because our stocks are the world's largest, our cutting and handling facilities unsurpassed. But our business depends on small orders as well, and you'll find we never lose sight of this fact. Whether you want one bar or a thousand—one sheet or many tons, you'll get courteous service—quick delivery. Dependable, certified quality, too. Call us and see.

JOSEPH T. RYERSON & SON, INC. **RYERSON STEEL**

Principal products in stock: Bars, structurals, plates, sheets, tubing, alloy steel, stainless, re-bars, etc., also machinery & tools

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PITTSBURGH • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

ANACONDA COPPER MINING COMPANY—YERINGTON MINE

DART DAILY SERVICE REPORT

Date	Truck No.
Check Engine Oil Level	
Check Converter Pressure & Temperature	
Check Radiator Water Level & Anti-Freeze	
Wash & Refill Air Cleaner	
Lubricate Chassis Complete	
Check Oil Level—Gear Boxes	
Check Oil Level—Differentials	
Check Oil Level—Rear Hubs	
Check Oil Level—Hoist Tank	
Check Oil Level—Booster Tank	
Run Up Hoist Scopes & Check	
Check Operation of Brakes	
Check Lights, Horn & Heater	
Check All Instruments for Operation	
Check Wheel Nuts	
Fill Fuel Tanks (Tires 85 lbs.)	
Check All Bolts & Springs	
Check Booster Sheave	
Check Batteries	
Check Breathers	
Bleed Air Tanks	

Work performed by:

Fm. 31, 11-5-53, 10M, M.V.N.

ANACONDA COPPER MINING COMPANY—YERINGTON MINE

DART 3200 HOUR SERVICE A

Date	Truck No.
Inspect; Replace if worn beyond limits:	
Crankshaft	
Main bearings	
Connecting rod bearings	
Pistons	
Clyinder liners	
Install new piston rings	
Remove & Clean: Heat exchanger	
Oil cooler	
Oil pan	
Remove & replace with rebuilt units:	
Cylinder heads	
Upper, lower rocker lever housings, levers	
Lubricating oil pump, if worn	
Fuel pump	
Injectors & inlet connections	
Water pump	
Super charger	
Air compressor	
Inspect drive unit bearings; replace if needed	
Clean air intake & exhaust systems	
Complete lub.; change fuel & lube filters	
Road test engine	
Remarks:	

Work performed by:

Fm. 300, 10-10-52, M.V.N.

ANACONDA COPPER MINING COMPANY—YERINGTON MINE

DART 3200 HOUR SERVICE B

Date	Truck No.
Complete inspection—Rebuild as needed:	
Brake system	
Universal joints	
Spring system	
Battery boxes	
Transmission	
Torque Converter	
Hoist pump	
Differential	
King pins & bushings	
Body	
Electrical system	
Remarks:	

Work performed by:

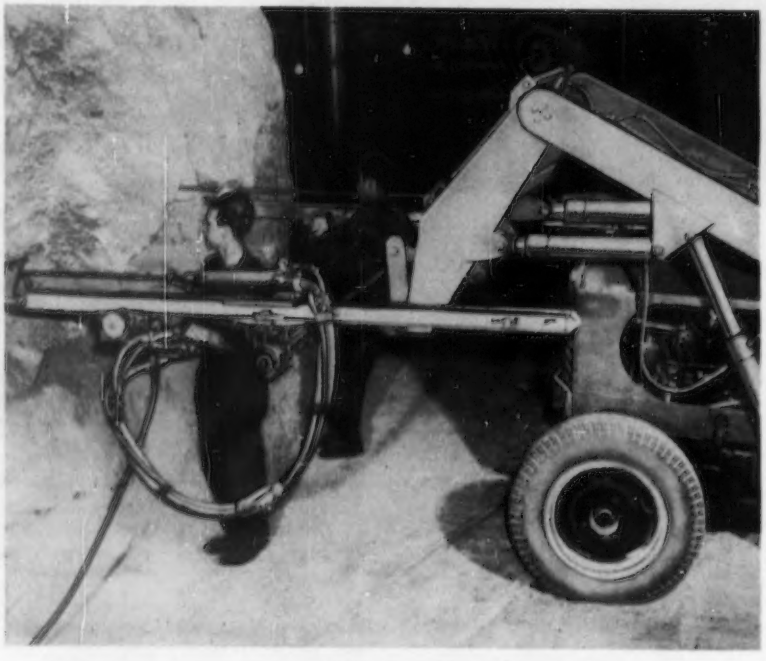
Fm. 301, 10-10-52, M.V.N.

Scheduled Truck Service Keeps Darts Rolling at Yerington

IT TAKES REAL SYSTEM to keep the thirty 25-ton Dart trucks in operating shape at Anaconda's Yerington project (See *E&MJ*, August 1954, p 92). These check list cards tell at a glance what vital jobs and inspections have to be performed daily and at 3200-hr intervals. Similar cards are used for additional check-ups at 100, 200, 400, 800, and 6400 hr. This system was set up by W. M. Cross, garage foreman, in charge of a 76-man garage crew.

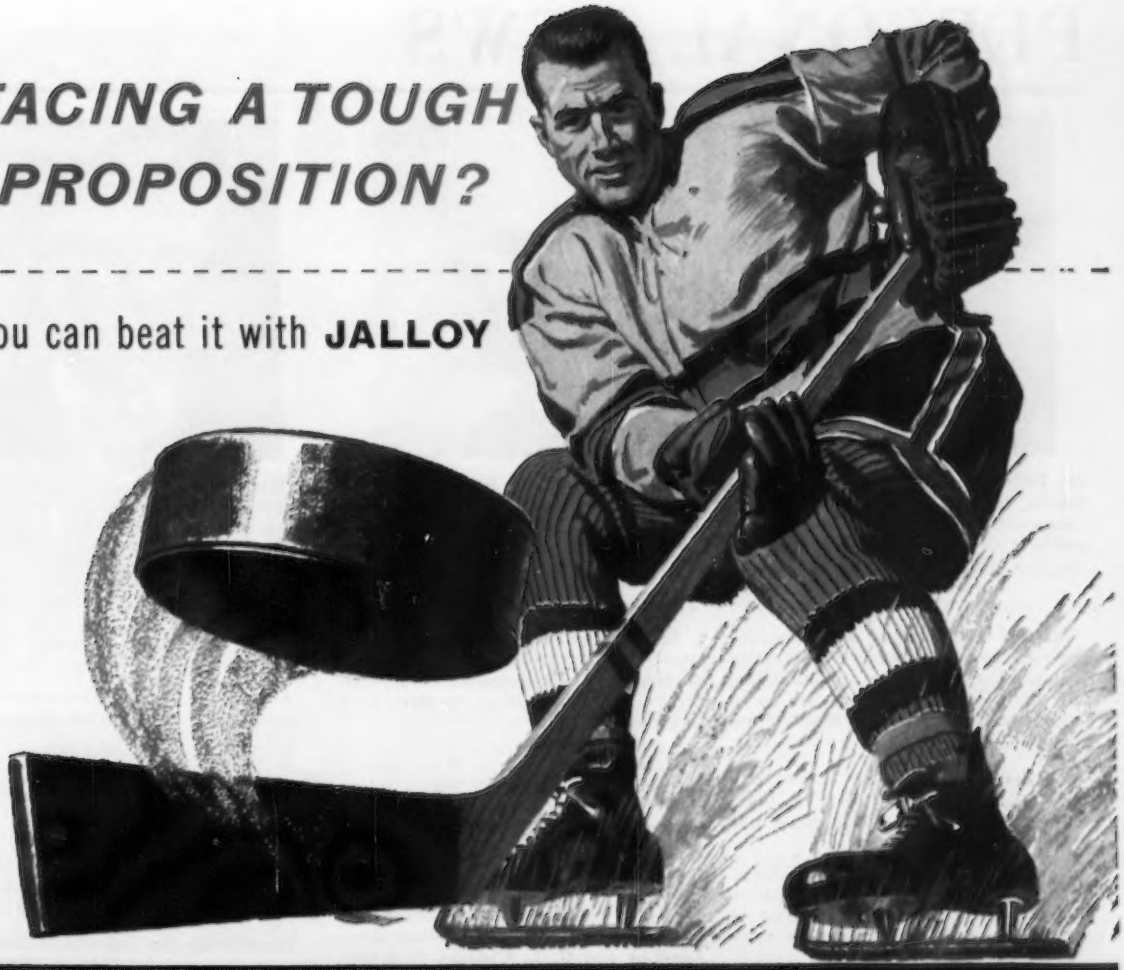
Hydraulic Loader Cuts Drilling Time

MANY MAN-HOURS of drilling time can be saved with this jumbo consisting of two pneumatic rock drills mounted on the loader mechanism of a heavy-duty loader. The crowd mechanism of the Lessmann loader shown here exerts a forward thrust while the tractor portion of the unit is standing still. Moving a single lever will withdraw the drill easily and reposition them quickly. The loader can exert a force as much as 15,000 lb while standing still, according to Lessmann Mfg. Co., manufacturers of the complete unit. Drilling positions as high as 6 ft above the wheel level can be reached as easily as those for drilling lifters. Overall height of the unit is less than 6 ft when the loader mechanism is lowered.



FACING A TOUGH PROPOSITION?

you can beat it with **JALLOY**



J&L JALLOY HEAT-TREATED PLATE BEATS WEAR DUE TO ABRASION

Jalloy Screens maintenance costs on coal conveyors

Jalloy provides longer wear with less repair in truck bodies

Jalloy Plates outlast other steels by margins of 4 to 1

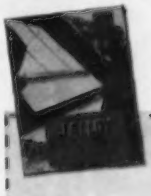
Jalloy Aprons in Tyrrock screens last 3 times as long as other steels

J&L Jalloy Heat-Treated Plate is the special purpose steel that is heat treated to provide longer wear on applications where impact and abrasive conditions are severe.

In comparison with other abrasion-resistant steels as well as mild steels, it gives optimum results when heat treated to a Brinell hardness of 340 and up. Jalloy permits savings in steel costs, maintenance, and repair. Furthermore, it is easily welded. Jalloy is available in three grades to meet various service requirements.

J&L STEEL

Jones & Laughlin
STEEL CORPORATION — *Pittsburgh*



Complete data concerning CHEMICAL COMPOSITION . . . HEAT TREATMENT . . . WELDABILITY . . . PHYSICAL PROPERTIES . . . will be mailed to you promptly. Write today.

Jones & Laughlin Steel Corporation
3 Gateway Center, Dept. 478, Pittsburgh 30, Pa.

☐ Please mail complete data concerning Jalloy.
☐ Please have your representative call.

Name_____ Title_____

Company_____

Address_____

_____

PERSONAL NEWS

Dr. Phillip L. Merritt, former assistant director for exploration, Atomic Energy Commission, has been appointed senior geologist for E. J. Longyear Co. Dr. Merritt will initiate consulting services in New York City.

H. DeWitt Smith, of Newmont Mining Corp., a leader in the activities of the American Institute of Mining and Metallurgical Engineers, will serve as president of the AIME for 1955, succeeding Leo J. Reinartz.

T. B. Counselman, for 27 years a noted member of the Dorr Co., has joined Behre Dolbear & Co., New York City, mineral consultants. Mr. Counselman is currently a vice president and a director of the AIME

Harry J. Wolf, mining and consulting engineer, is now examining and prospecting some kyanite deposits in North Carolina. Following that visit, he will travel to Cuba to investigate some copper properties.

Charles Weiler, Dover, N. J., has been promoted from mine captain to assistant superintendent by the mining division of the Alan Wood Steel Co.

Van H. Voit, manager of industrial relations for Koppers Co. Inc., has been named director of employee relations of Crucible Steel Co., Pittsburgh.

E. M. Krisman has been named smelter superintendent at the AS&R Tacoma plant. He joined the plant in 1937 as an assayer and later served as supervisor in various plant departments.

Burt Hartmann, R. T. Brown, Jr., R. A. Hildebrand and **Robert Hurst,** graduate geological and mining engineers of the Colorado School of Mines, have formed Technical Services, Inc., a geological service organization, at Grand Junction, Colo.

H. W. Mallery, former geologist with New Jersey Zinc, is now in Bonne Terre, Mo., serving as geologist for the St. Joseph Lead Co.

Stuart A. Falconer was named chief metallurgist of the mineral dressing department of American Cyanamid Co., succeeding the late **S. J. Swainson.**

Harry V. Pike, former assistant mine superintendent for Broulan Reef Mines, Ltd., has been named superintendent.

J. H. Salter has been named general superintendent, chemicals and fertilizers division, Consolidated Mining and Smelting Co. of Canada.

G. G. Hatch and **P. J. Ensio** have been named plant superintendent and research director, respectively, for Quebec Iron and Titanium Corp., Sorel, Que.

Ernest Hartford, 71, has retired as deputy secretary of the American Society of Mechanical Engineers after 43 years' service. He will continue to serve in a consulting capacity.

John R. Quayle, Iron River, Mich., superintendent of the Hiawatha mine, and **Lawrence Collins,** superintendent, Richmond open pit mine, both 40-yr veterans of the M. A. Hanna Co., were honored at the 5th old timers dinner.

Gordon Babbel has sold Uranium Engineering Co. to **Col. T. R. Gillenwaters, Lee Cox** and **C. L. Chitman** to devote his full time to the newly-formed Babbel Research Foundation.

Recipients of AIME awards for achievement in the mineral industry were:

Edwin Letts Oliver, president Oliver United Filters, Inc. and AIME director, the James Douglas Gold Medal;

George Herman Deike, chairman of the board, Mine Safety Appliances Co., the Erskine Ramsay Gold Medal;

Dr. Gust Bitsianes, assistant professor, department of metallurgy, U. of Minnesota, the J. E. Johnson Jr. Award;

Edward Wilson Davis, director-professor, Mines Experiment station, U. of Minnesota, the Robert H. Richards Award;

Harold Vagtborg, Jr., petroleum engineer, National Bank of Commerce, the Rossiter W. Raymond Award;

W. G. Phann, metallurgist, Bell Telephone Laboratories, the Mathewson Gold Medal;

R. E. Thurmond, mine superintendent, Pima Mining Co., the Robert Peele Award;

F. W. Boulger, supervisor of metallurgy, and **R. H. Frazier,** Battelle Memorial Institute, the Robert W. Hunt Award;

E. D. Gardner, chief mining engineer, USBM, the Daniel C. Jackling Award.

J. M. Currie is in Shinyanga district, Tanganyika, with Williamson Diamonds.

Allen James is geologist for Kennecott Copper in the Utah Copper division.

W. A. Roxburga, former mine foreman at Steep Rock Iron Mines Ltd., is now superintendent at the asbestos mine development of United Asbestos Corp., Thetford district, Quebec.

Claude O. Stephens, vice president of Texas Gulf Sulphur Co., has been appointed general manager for production.

David White has joined Alcoa Mining Co. at Bauxite, Ark. He is succeeded as field geologist, Oregon department of geology, by **Max Schafer,** formerly of USGS.

George V. Keller, geophysics branch, USGS, has been transferred to the Denver office.

A. D. Vickers is now with the sales department of Chicago Pneumatic Tool Co. in the St. Louis district office.

Mitchell A. Light, former assistant professor in the geology department of the University of Massachusetts, Amherst, is now research geologist with California Research Corp., La Habra, Calif.

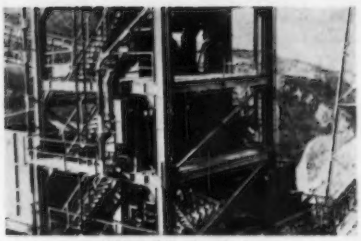
John W. Lampert is now with Surinaamsche Bauxite Maatschappij at Paranam, Surinam, engaged in bauxite beneficiation.

Parker W. Negus, former mining engineer with USBM, is now a member of the staff of Michael Baker, Jr., Inc., consulting engineers.

E. D. Wilkins, Kaiser Aluminum & Chemical Corp., is now general superintendent of the corporation's bauxite mining, processing and shipping in Jamaica. **Paul Zeigler,** director of the department of metallurgical research has moved to the firm's headquarters at Oakland, Calif. He is succeeded at Spokane

ANYWHERE IN THE WORLD

YOU'LL FIND KENNEDY MACHINERY & EQUIPMENT ON THE JOB!



MAIN SCREEN HOUSE SHOWING SAND SIZER AND NO. 38 KENNEDY SECONDARY CRUSHERS AT SARIYAR DAM, TURKEY

STONE STORAGE—CONVEYORS NO. 3, 4, 5, 6, and 7 WITH TWO 5' x 12' DOUBLE AND TRIPLE DECK "AAA" KENNEDY SIZING SCREENS AT SARIYAR DAM, TURKEY

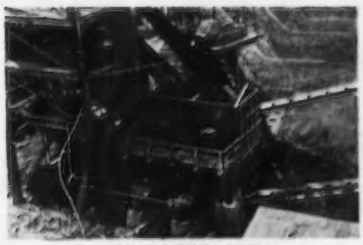
Here's a typical example . . . complete cement manufacturing equipment for SARIYAR DAM, TURKEY. *Another* KVS installation, operating at peak capacity in producing the cement required to build this enormous dam.

Whether the work to be done is in Turkey or Timbuktu, Alaska or South Africa, KVS engineers have designed and installed the *right* equipment. Right in performance . . . right in construction . . . right in quality.

KVS machinery and equipment is in use throughout the world and has established a reputation for economical operation, maximum output and low maintenance cost that has *no* equal!

KVS engineers are available for consultation anywhere in the world. Let us help you solve your cement, lime and crushing problems. Send for bulletins describing KVS machinery and equipment.

48" x 16" KENNEDY STEAM SHOVEL ROCK FEEDER WITH NO. 30 PRIMARY GYRATORY CRUSHER AT SARIYAR DAM, TURKEY



MAIN SCREEN HOUSE AND NO. 38 KENNEDY SECONDARY CRUSHERS AT SARIYAR DAM, TURKEY

IT COSTS LESS TO OWN THE BEST!

KENNEDY-VAN SAUN

MANUFACTURING & ENGINEERING CORPORATION

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"Pete" Casarotto, mine superintendent of the El Teniente caving operations of the Braden Copper Co. at Sewell, Chile, stands beside a sign in the underground mine office which lists production records. Note item at top, "Record—82,554 tons of ore in 24 hours on Dec. 21, 1942."

by **Dr. D. W. Smith**, and **S. E. Maddigan** will be assistant director, serving with assistant director **Dr. L. W. Eastwood.**

Fay W. Libbey, director of the Oregon Department of Geology and Mineral Industries since 1944, retired Nov. 1 under the state retirement system. Assistant director **Hollis M. Dole** has been named acting director by the board of governors.

Dooley P. Wheeler, Salt Lake City superintendent of western exploration for American Metals Inc., has left that firm to enter mine consultant work.

Walter J. Ackert has been named concentrator superintendent of the Nevada mines division by Kennecott.

Nelson J. Darling Jr., of Boston, Mass., was elected a director of Copper Range Co., filling the position of **Albert Pratt,** recently appointed Assistant Secretary of the Navy.

Dr. R. Campbell has been appointed resident geologist for the Yukon, with headquarters at Whitehorse.

H. J. Bergmann is new consulting engineer for Copper-Uranium Ltd.

Arden Swanson, Ironwood, Mich., mining engineer, has been transferred from the Gogebic iron range by PM&Co. to the Erie Mining taconite operations at Aurora, Minn.

Pat E. Sayre is at Dove Creek, Colo., engaged in uranium mining in the Slick Rock district.

James L. Head, mining engineer, Anaconda Copper Mining Co., has been re-elected president of United Engineering Trustees, Inc.

Nick Reyes, White Pine County, Nev., was the first recipient of a Consolidated Coppermines Foundation Scholarship, a grant of $500 offered by Consolidated Coppermines Corp. **A. J. O'Connor,** vice president and general manager, has announced that the scholarship will be offered annually to a student of the County High School.

C. L. Kessler has been appointed chief metallurgist at Alcoa's Massena (N.Y.) operations; **A. M. Miller** replaces him as assistant chief metallurgist at Edgewater, N.J.; **F. O. Traenkner** has been appointed assistant chief metallurgist at Massena.

Roger C. Baker, former district geologist at Little Rock, Ark. with USGS, is on FOA assignment in Pakistan. **Philip E. LaMoreaux,** district geologist at Tuscaloosa, Ala., is on a three-month's assignment to Thailand.

George S. Wheaton, former assistant vice president of American Potash & Chemical Corp.'s Eston Chemicals division, Los Angeles, has been named vice president in charge; **Thomas F. Edson,** former assistant vice president of research and development, is now vice president in charge of special engineering projects; and former secretary **Richard J. Hefler** becomes assistant to the president.

Dr. Ralph J. Holmes, member of World Mining Consultants, was head of a recent mission which completed a mineral resource survey of Somalia for the government of Italy. Other members of the mission were **Dr. Felix Herman,** Paris; **Dr. Emilio Lino** and **Dr. Gabor Dessau,** Rome, Italy.

T. R. Fuller, graduate of Missouri School of Mines in May 1954, is now serving as a 2nd Lieutenant at Fort Belvoir, Va.

Colin Donaldson, former assayer at Wallace, Idaho, for AS&R, is now located at Bishop, Calif., where he is doing assaying work for Wah Chang Corp.

Dr. George A. Kiersch has been granted a year's leave of absence from University of Arizona to direct the mineral resources survey, Navajo country. The geology professor's survey is expected to be completed in late 1955.

John E. Crawford, production engineer, AEC raw materials division, is now commodity specialist in uranium, radium and thorium for USBM.

James C. Parlee, manager of reduction plants, International Nickel Co. of Canada, Ltd., has announced the following appointment: **F. J. Morrow** to general superintendent of smelters; **R. R. Saddington,** superintendent of Copper Cliff smelter; **D. A. Fraser**, assistant to Mr. Parlee. **H. J. Mutz,** manager of mines, announced appointments of **B. T. King** to superintendent, Garson mine and **S. J. Sheehan** to assistant superintendent, Frood section, Frood-Stobie mine.

Sam L. Broadhurst, Raleigh, N. C., assistant state geologist, was elected chairman of the Eastern North Carolina sub-section, AIME, at a meeting in Henderson, Dec. 4. Vice chairman is **Dr. E. Willard Berry,** chairman, Department of Geology, Duke U., and secretary-treasurer, **Dr. J. M. Parker** of Geology Department, N. C. State.

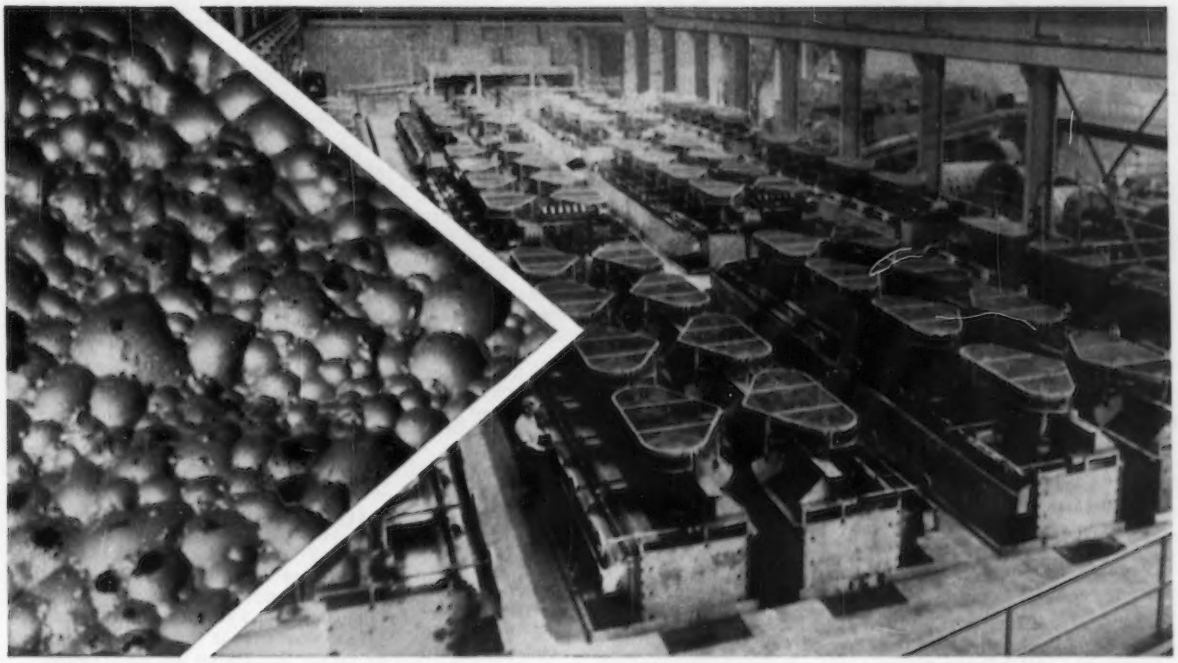
Arthur F. Betchart, chief engineer of Pend Oreille Mines & Metals Co., Metaline Falls, Wash., has taken a similar position with American Metal Co., Newcastle, New Brunswick. **C. A. R. Lambly,** former superintendent at Pend Oreille, is assistant manager of the mining department at American Metal.

Dr. Charles Rasor, AEC, has been elected president of the Grand Junction Geological Society, succeeding **Richard P. Fisher.** Other officers are: **John X. Combo,** and **Tom Kirby.**

Northwest Mining Association, during the recent convention at Spokane, re-elected **Karl W. Jasper,** president of Grandview mines, association president; **P. Evan Oscarson,** consulting geologist, vice president; **Robert E. Sorenson,** Hecla Mining Co. chief geologist, vice president; **Robert J. Towne,** Towne Equipment Co., secretary; and **E. K. Barner,** Spokane banker, treasurer. Trustees installed were: **R. D. Leisk,** vice president and general manager, Sunshine Mining Co.; **L. M. Kinney,** general superintendent, Pend Oreille; **Rollin Farmin,** Day Mines; **E. H. Lovitt,** Lovitt Mining Co.;

DOWFROTH 250

BUILDS BETTER FROTH AT LOWER COST



This quality frothing agent by Dow raises concentrate grade and increases recovery —with less frother consumption!

Dowfroth® 250 in many mills today is producing improved metallurgy with as little as one-fourth the consumption of previous frothers used. These are not just laboratory tests, but full-scale mill results. This could mean increased profits and lower operating costs in *your* mill, too.

Dowfroth 250 is easy to use—requires minimum conditioning for stage addition. Its water solubility permits accurate regulation as a water solution if you prefer this method. And it demonstrates little or no collecting power, which allows your operator to regulate frother and collector independently. This hard-working frother by Dow also spares the rubber covered parts on your flotation machines—shows minimum swelling and deterioration to save you money in maintenance.

Prove the economy and efficiency of Dowfroth 250 in your own mill by using a test sample with our compliments. Write to THE DOW CHEMICAL COMPANY, Midland, Michigan, Dept. OC-834H-2.

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and **C. H. Mitchell,** secretary of B. C. Mining Association and editor of *Western Miner.* Elected life members were **Joseph Daniels, A. W. Fahrenwald, C. Y. Garber, Charles W. Newton, W. T. Simons, Compton I. White, Eugene A. White, F. W. Libbey,** and **Harry Hedrick.**

Frank Kerekes, assistant dean of engineering and professor of civil engineering at Iowa State College, has been named dean of the academic program at Michigan College of Mining and Technology, Houghton, Mich.

A. J. Speal, former staff engineer with Tungsten Mining Corp., Henderson, Nev., is now with the ore reserves section, AEC, at Hot Springs, S. D.

D. Melong, of Kirkland Lake, former mill foreman, has been appointed superintendent of milling operations at the Wright-Hargreaves Mine, succeeding the late **Malcolm Black.**

John J. Curzon, formerly with the AEC at Grand Junction, has been named director of exploration and development for Climax Molybdenum Co.

W. H. Durrell, former general manager of Hollinger-Hanna, was named vice president and **C. E. McManus,** former project manager of Iron Ore Company of Canada, was named general manager of Hollinger-Hanna Ltd.

William Bellano has been named production manager of the phosphate chemicals division of International Minerals & Chemical Corp. He will be in charge of the company's Bonnie (Fla.) plant, where **Neil B. O'Donnell** was also promoted to assistant manager of production and **Robert V. Safford** was named assistant manager of general engineering.

Phillips Hawkins has been named assistant to the vice president, raw materials, U. S. Steel Corp. Mr. Hawkins is former general attorney for the corporation.

John Croston, GSA mining engineer, who was in Subury, Cobalt and Deloro areas in Canada earlier this year, has just returned to Washington, D.C. following another visit to the U.S. Tin Corp. property at Lost River, Alaska.

Ward W. Minkler has been named assistant manager of market development of Titanium Metals Corp.

Theodore J. Albrecht, Brewster, Fla., has been named assistant mill superintendent; **Carl Wilson** is mechanical foreman; **Fred Thornburg,** chief electrician; **Laney Dettmar,** head of welding section; **George Franklin,** pipe, steam and water service foreman; and **Ernest Maplies,** vehicle repair at Foote Mineral Co., Kings Mountain, N. C.

In moves which brought the staff of the Idaho Bureau of Mines to full complement **Lewis S. Prater** became assistant director; **Harold A. Powers** was named bureau geologist; and **Charles R. Kurtak** was named chemist-analyst.

T. M. Andersson has joined Neptune Gold Mining Co., Bonanza, Nicaragua, as assistant mill superintendent.

James W. Cole, former metallurgist with American Cyanamid, is now mill superintendent at Surcease Mining Co., Johannesburg, Calif.

C. R. Amis has been named assistant unit superintendent, AS&R, Aurora Xichu, Mexico.

Werner P. Wolff, chief mining engineer, Oliver Iron Mining, has retired from active service with the company after more than 42 years.

R. R. Williams, Jr. has succeeded the late **George H. Rupp** as manager of mines for CF&I in Pueblo, Colo.

OBITUARIES

James F. Jones, 65, vice president and general manager of the U. S. Powder Corp., died Nov. 8 after a short illness.

Malcolm Black, 69, superintendent of the Wright-Hargreaves Mines, Ltd., for 27 years, died suddenly at his home in Kirkland Lake, Ont., Can., on Nov. 7. He joined Wright-Hargreaves in 1928, where he was in charge of the milling plant until his death. During that time, Mr. Black saw mill capacity doubled under his direction.

L. E. Pierson, 84, member of the AS&R board of directors, died Nov. 10.

George A. Guess, 81, noted metallurgical engineer and consultant and professor of metallurgical engineering, University of Toronto, died Oct. 21.

Walter R. Minton, 63, superintendent of GNRR's Mesabi division since 1952, died at his home in Superior, Wis., Nov. 27.

William A. Knox, 78, president and founder of Little Ajo Mining Co. and Knox-Arizona Mining Co., died Aug. 9 in St. Louis, Mo.

Edmund J. Longyear, founder of the E. J. Longyear Co., died Dec. 4, in Los Angeles after a lengthy illness. Mr. Longyear played an important part in the development of the Mesabi, superintending the first diamond drilling there in 1890. He is the author of an autobiographical sketch of early Mesabi Range history, "Mesabi Pioneer."

Letters *(Continued from p 4)*

um would show so we took another sample of the same material to the same operator under date of Aug. 2, 1954, and asked him to add some ammonia sulphate.

His report, No. 388009, dated August 5, 1954, is as follows:

"REPORT OF QUALITATIVE SPECTROGRAPHIC EXAMINATION

Ammonium Sulphate Added

Element	Approximate quantity
potassium, rhenium	Major constituents.
	Minor constituents:
sodium	0.05%
calcium	0.05%
magnesium	0.05%
iron	0.005%
chromium	0.001%"

I mentioned this in a letter to John R. Musgrave of Eagle-Picher and he wanted to know how it was done, so, thinking it might be of value to others, I am answering him by sending him a copy of this letter to you. Incidentally, we also discovered that germanium forms complexes with tungsten at all pH's and, therefore, it is necessary to remove the germanium before we can recover the tungsten.

EARL R. NIXON
Foreman Research Laboratory
Arlington, Calif.

Rocks for Frostproof

SIR:

(I recently donated a collection of rock and ore samples to Frostproof High School, Frostproof, Fla. The rocks will be displayed in the school, arranged according to geological time and classified, for examination and study by the students.)

I am wondering if, through you, mining companies throughout the world couldn't be induced to mail our school small samples of ores, etc.

EDWARD T. KEENAN
Frostproof, Fla.

Ed: Major Keenan, now retired, was a superintendent at one of Florida's largest phosphate mines.

New Subscriber

SIR:

As a new subscriber to your magazine . . . I am (pleased by its presentation), the interest of your articles, and the information you give, especially the news from Chile, which is always up to date. I . . . congratulate you thoroughly.

JORGE LOPEZ INIGUEZ,
Minera Las Dolomitas S.A.
Valparaiso, Chile

Mining Patent Attorney?

Sir:

I will be much obliged if you could recommend or suggest a patent attorney specialized in mining equipment for a patent which I wish to take in the U. S. A.

H. E. BELLIARD, METALLURGIST
Companhia de Estanho Sao Joao del Rei
Nazareno
Minas Gerais, Brazil

"Say, what's wrong with my mine cable?"

"Lots of times we find cable sections like this—necked-down. And that's only one of our troubles. Our cables short out too often. Sometimes jackets creep back from splices. Other times we find broken ground wires. What in thunder are we doing wrong?"

"Well, here's a big part of your trouble:"

"Hourglass sections are a sure sign of too much tension on the cable. So are the other troubles you mention. To end tension . . . keep spring-type shocks at the power source. Keep the reel pulling evenly. Adjust it so there's no back-spooling. Watch out for kinks. And be sure you use a cable that can take it when the going gets tough. Then you'll put an end to your trouble and keep your cables on the job far longer. And remember, one break costs more than the difference in price between a cheap cable and a quality one!"

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Are cables all alike? No! Quality cables – like ANACONDA's Securityflex* – have proved themselves over the years. Here's why ANACONDA Cables last longer and are safer. The ground wire can stretch more. It will *not* break before the power conductors. *That's a real safety feature.* Jacket is made of a new Neoprene formula. It is stronger. Insulation is long-life, tough cold rubber. It all adds up to real economy *in use.* Get the full facts from your Anaconda Representative. *Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.*

*Trade Mark

the right cable for the job

ANACONDA®

WIRE AND CABLE

 (Continued from page 69)

Chrome Ore Consumption Again Rising

DURING THE THIRD QUARTER of 1954, U.S. consumption of chrome ore for metallurgical purposes increased 13% over the second quarter, according to the Bureau of Mines. September consumption of all chrome ore rose 14% compared with August, and was 4% higher than the average monthly consumption for the nine-months' period of the current year. Metallurgical consumption gained 25%, refractory dropped 2% and chemical rose 7%.

Mine and mill shipments of domestic chrome ore in September totaled 12,764 tons, making the total for the nine months 118,000 tons. During all of 1953, domestic output was estimated at 58,817 tons. On a dry weight basis, September shipments from California totaled 1,837 tons, Montana 9,151 tons, and Oregon 1,185 tons. The average chromic oxide content of domestic production was 41%.

Chrome ore statistics of the Bureau of Mines for 1953 and the Jan.-Sept. period of 1954, figures in short tons, are summarized as follows:

	1953	Jan.-Sept. 1954
Domestic output	58,817	118,000
Imports	2,226,610	1,212,347
Total new supply	2,285,427	1,320,347
Consumption	1,335,755	650,506
Industry stocks;		
Metallurgical	607,724	855,707
Refractory	259,896	258,494
Chemical	148,258	178,201
Totals	1,015,878	1,302,402

(a) Stocks on hand Dec. 31, 1953.

Total imports of chrome ore in September amounted to 74,573 long tons (gross weight), of which 18,542 tons was metallurgical, 37,622 tons refractory, and 18,409 tons chemical. The Philippines was the chief supplier of chrome ore to the U.S., shipping 34% of the total tonnage received during September. All of the Philippines ore was refractory grade. Rhodesia supplied 49% of the total imports of metallurgical grade ore, and the Union of South Africa was the sole shipper of chemical ore. Total value of September imports was $1,710,642.

Imports of chrome ore into the U.S. during September and the nine months ended September, in long tons:

Metallurgical grade;	Sept.	Jan.-Sept.
Federation of Rhodesia and Nyasaland	9,042	199,029
Iran	—	1,000
New Caledonia	—	26,600
Pakistan	1,500	7,481
Philippines	—	41,382
Sierra Leone	—	2,693
Turkey	8,000	209,405
Union of So. Africa	—	80,457
Total metallurgical	18,542	568,047
Refractory grade;		
Cuba	9,720	29,353
Fed. of Rhodesia and Nyasaland	1,686	13,909
Greece	—	49
India	1,000	12,759
Philippines	25,216	312,304
Union of So. Africa	—	8,335
Total refractory	37,622	376,709
Chemical grade;		
Union of So. Africa	18,409	128,768
Totals, all grades	74,573	1,073,524

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipments f.o.b. New York unless otherwise stated, tons of 2,000 lb. unless otherwise noted.

MISCELLANEOUS METALS

December 31, 1954

Aluminum ingot, 99 plus percent, lb.	22.2¢
Antimony, spot, lb., less than carload, in cases	31.97¢
In bulk, carload lots, f.o.b. Laredo	28.50¢
Bismuth, ton lots, lbs.	$2.25
Cadmium, commercial sticks, delivered, lb.	$1.70
Calcium, lb., ton lots, 98 percent, cast	$2.05
Chromium, 97 percent grade, lb., contract	$1.18
Cobalt, 9- to 99 percent, per lb.	$2.60
Germanium, lb.	$295.00
Indium, troy oz.	$2.25
Lithium, lb., 98 percent	$11.00 @ $14.00
Nickel, cathodes, lb., f.o.b. Port Colborne (a)	64½¢
Magnesium, 99.8 percent, carloads, lb., producer's plant, Freeport, Texas	27¢
Palladium, troy oz.	$17 @ $21
Platinum (wholesale lots) troy oz.	$78.00 @ $84.00
Quicksilver, flask of 76 lbs., 25 flasks or more	$322 @ $324
Selenium, 99 plus percent, lb.	(b)$5.00 @ $6.00
Silicon, minimum 97 percent, carloads, lb.	18¢
Tellurium, lb.	$1.75
Thallium, 100 lb. or more, lb.	$12.50
Titanium, 99.3 plus, grade A, max. 3% iron, lb.	(c)$4.50

(a) Includes U. S. duty. (b) Depending on quantity. (c) Effective Dec. 1.

METALLIC ORES

Beryllium Ore, imported, 10% BeO, per short ton unit	$39.00 @ $40.00
Chrome Ore per long ton, f.o.b. cars Atl. ports, dry:	
44% Cr_2O_3 no ratio	$21.00 @ $22.00
48% Cr_2O_3 3 to 1 ratio	$43.00 @ $46.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$10.30
Mesabi bessemer	$10.05
Mesabi, non-bessemer	$9.90
Lead (Galena), 80 percent, Joplin, Mo., ton	$187.85
Manganese Ore—Per long ton unit of Mn basis 48 percent manganese, nearby positions, subject to premiums and penalties 78 @ 80¢ c.i.f. U. S. ports, duty extra. Long-term contract nominal at 75 @ 78¢ c.i.f. duty extra.	
Molybdenum Ore, 90%, per lb. of Mo f.o.b. mines	$1.05
Columbium-Tantalum, per lb., combined oxides	$3.40
Tungsten Ore, per unit of WO_3:	
Foreign 60 percent, c.i.f. U. S. ports, duty extra	$25.75 @ $26.25
Domestic, scheelite, 60 percent f.o.b. mill	$63.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	31¢
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton	$68.00

METALLIC COMPOUNDS

Arsenous Oxide (arsenic trioxide) lb., in bbl. carload lots delivered	5¼¢
Cobalt Oxide, 72½% to 73½%, ceramic grade, per lb.	$1.96 @ $1.97½
Copper Sulphate, 100 lb.	$10.35
Germanium Oxide, lb.	$142.00

ALLOYS

Ferrochrome, 65 to 69 percent, per lb. of Cr contained	24¾¢
Ferromanganese, 74-76%, net ton, seaboard	$190
Ferromolybdenum, 55 to 65 percent Mo. lb. of Mo. contained	$1.49 @ $1.57
Ferrosilicon, 50 percent per lb. of contained Si	12¢
Ferrotungsten, 75 to 80 percent, lb. of W contained	$3.00 @ $3.25
Ferrovanadium, per lb. of V delivered	$3.80
Silicomanganese, Max. 1½ percent carbon, lb. per contracts	11.4¢
Spiegeleisen, per long ton, 19 @ 21% grade	$86.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds) ton:	
Crude No. 1	$960 @ $1,500
Crude No. 2	$595 @ $900
Spinning fibers	$321 @ $514
Shingle fibers	$150 @ $200
Paper stock	$109 @ $137
Waste	$77
Shorts	$35 @ $70
Asbestos, f.o.b. Vancouver, B. C. (U. S. funds):	
Spinning fiber, 3-K	$460
Shingle fiber, 4-K	$185
Asbestos, Vermont, f.o.b. Hyde Park:	
Spinning fibers	$279.50 @ $302.00
Shingle stock	$135.00 @ $162.00
Paper stock	$81.50 @ $115.00
Waste, stucco or plaster	$71.40
Refuse or Shorts	$34.00 @ $63.00
Barytes f.o.b. cars:	
Georgia, crude, per ton	$15.00
Missouri, 94 percent $BaSO_4$, per short ton	$13.25
Bauxite, long ton, f.o.b. point of shipment:	
Domestic crude, 50 to 52 percent (not dried)	(a) $5.00 @ $5.50
Domestic, chemical, 55 to 58 percent	(a) $8.50 @ $9.05
Domestic, abrasive, 80 to 84 percent	(a)$18.00 @ $18.50
Feldspar, bulk ton.	
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50 @ $22.25
Glass feldspar, white, 20 mesh	$11.75 @ $12.50
Fluorspar, f.o.b. mines, bulk, 70% effective, ton	$32.00 @ $33.00
60% effective CaF_2	$28.00 @ $29.00
Acid 97% concentrate, bulk, ton	$47.50
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00 @ $14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington	$38.00
Mica—Domestic, f.o.b. mines, Punch 12 to 22¢ per lb. according to size and quality. Sheet clear, 1½ x 2 inch, 70¢ to 85¢; 2 x 2 inch, $1.10 to $160; 2 x 3 inch, $1.50 @ $1.60; 3 x 3 inch, $1.80 @ $1.90; 3 x 4 inch, $2.20; 3 x 5 inch, $2.40; 4 x 6 inch, $3.15; 6 x 8 inch, $4.25. Wet, ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground: $32.50 @ $70.00 per ton. Scrap $25 and up.	
Ocher, Georgia, ton, in sacks	$26.50 @ $30.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	Not quoted
Sulphur, Texas, mines, long ton	$25.50 @ $27.50
Talc, f.o.b. works, ton	
New York, purified	$18.50 @ $20.00
Vermont, extra white	$13.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$30.00

(a) Normal. (b) Effective Oct. 1.

IRON AND STEEL

Pig Iron, gross ton, basic, Valley Furnaces	$56.00
Steel f.o.b. Pittsburgh, billets, net ton	$64.00
Structural shapes, 100 lb.	$4.25

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MODERN PROSPECTORS now search for new mineral deposits first with the airborne magnetometer in conventional aircraft, flying 500 feet above the terrain. Then, when the target area has been marked out, they move in for detailed studies with the helicopter-borne magnetometer. These close range surveys, covering the terrain at treetop height, replace the slow, foot-slogging ground studies which used to follow the first air survey. Unhindered by brush, jungle or muskeg, these helicopter surveys quickly provide a final, continuous record that's more significant and less costly than ground studies.*

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WASHINGTON IMPACT

Morton A. Reichek, McGraw-Hill Washington News Bureau

Minerals Policy Committee Recommends Steps for Healthy Domestic Industry

THE LONG-DELAYED REPORT of the President's Cabinet Committee on Minerals Policy was something of an anticlimax since the Committee's main recommendations have been a matter of record for many months.

During the past year, in line with the Committee's program, the Administration (1) set up long-term stockpile goals for most metals and minerals to lessen U. S. wartime dependence on foreign sources of supply and to prop up lead, zinc, and possibly other prices, (2) gave a new lease on life to the DMEA Program, and (3) granted Interior Department considerable new mobilization authority in mining.

Most mining men here are satisfied with the mineral policy report, consider it a possible tipoff that the Administration may take a definite stand to keep domestic mine production at stable and healthy levels. Perhaps just as important, the report seems to bolster Assistant Interior Secretary Wormser's role in policy-making related to mining.

The report leaves unanswered, however, two sixty-four dollar questions: What are desirable price or production levels for individual metals and—more significant—What will the Government do to maintain them?

Present Authority Outlined

The Committee recommended that "a comprehensive program involving the best use of all the various existing authorities of the Government should be developed to maintain or to achieve . . . the proper level of efficient domestic production required as an adequate component of the mobilization base."

Existing authorities include such tools as these: direct expansion loans, loan guarantees, fast tax writeoffs, floor-price procurement contracts to stimulate output, stockpile purchases, duty assessments under the anti-dumping act, escape-clause relief under the tariff law.

Aside from stockpile buying, these authorities have been used sparingly by the Eisenhower Administration to aid mining. And only in the case of lead and zinc can it be said frankly that stockpiling has been employed mainly to support markets. The policy has been to grant defense loans and market guarantee contracts only for metals like nickel and titanium. It's unlikely that there will be a switch in this policy unless a new international emergency occurs.

Current Tariff Picture

President Eisenhower has already demonstrated his lack of sympathy for tariff hikes, most notably in lead and zinc. So it seems doubtful that mining can expect much aid on this front. It's noteworthy that reference to tariffs was omitted from the minerals policy report. Latest show of the President's stand on trade liberalization: White House order last month that Federal agencies cut price preferences to domestic bidders for Government contracts under the Buy-American Act.

Actually, there is now a threat that tariffs on some metals may be cut. At press time, for example, Washington was considering tariff-concession offers on tungsten ores and concentrates to be made at next month's Geneva Conference of the General Agreement on Tariffs and Trade. Multilateral trade negotiations will be conducted at that time aimed to bring Japan into GATT and help her increase exports.

The U. S. will spark this move by offering tariff concessions on scores of commodities to Japan and major nations that import goods from Japan.

Tungsten is one of the major items being considered for use as trading bait. The tariff law allows a 50% cut in the 50c a lb duty. The final decision has not been made so far, however.

On the other side of the ledger, the Government is considering import duty hikes on potash under the anti-dumping act. Treasury Department has determined that East German potash has been dumped here at prices below those charged elsewhere, is also studying potash imports from France, West Germany, and Spain.

Tariff Commission must now find whether such dumping has "injured" U. S. potash producers. If such is the case—and the decision is very much up in the air—Treasury will assess duties to make up the difference between foreign and U. S. prices.

Additional Policy Proposals

The Minerals Policy Committee said that if the Government is unable to maintain mining output required for mobilization, under its present powers, it should seek new authorities from Congress. But the report said: "The programs that are developed . . . must be consistent with the basic foreign and domestic economic policies of the Government." Some observers consider this statement additional sniping at tariff protection. The interpretation assumes, of course, that the Administration's basic policy is one of more free trade.

The first thing that comes into most people's minds—as a new authority—is direct subsidies for U. S. mines. Conjecture on this is heightened by the well-known interest of several influential Democratic Congressmen in such schemes.

Here are the Committee's other recommendations:

- **Interior Department should step up topographic and geological mapping, geological research, and development of geochemical and geophysical theories and techniques "which must precede or supplement private exploration."**

But the Committee suggested that direct exploration work be restricted to "that which provides data as to the probable location and general potential of mineral deposits, and . . . that this type of search be undertaken by the Federal Government only when it clearly is in the national interest and when it is reasonably certain that the work will not be done by private industry."

- **Interior should establish more formal contact with the mining industry.** Efforts to reconstitute the National Minerals Advisory Council have gotten nowhere in recent years. Main reasons have been the lack of clear statutory authority and the risk of anti-trust difficulties.

It is now understood that an "Industry Advisory Committee" for mining may be set up by Interior Department under the authority of the defense production act or stockpiling act. This would be similar to the mining groups that advised the Munitions Board on stockpile specifications and DMPA and GSA on mining expansion. Commerce Department now has numerous advisory commmittees of manufacturers, which are organized under the Defense Production Act.

- **Interior should step up research on development of latent resources, new mineral raw materials, and improved use of known materials; should coordinate such research with other Federal agencies and private industry; and strengthen its statistical programs.**

- **Tax laws affecting mining should be periodically reviewed to get rid of "deterrents . . . to the sound development of the nation's mineral resources."**

This recommendation is not specifically directed at Treasury, which would have to submit proposed revisions in the tax law to Congress. But Interior, whose role as mining spokesman in Government

INTERNATIONAL TD-24 CRAWLER strips 6 to 12 feet of overburden to reach the vein. Next step is loosening rock of vein with giant hydraulic ripper mounted on 161 hp. TD-24.

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ORE IS LOADED out by Haberle's INTERNATIONAL DROTT TD-9 Rock Fork bucket. TD-9 picks up ore, shakes out sand, dumps ore into luggers where it is broken up before it is hauled to the crusher.

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is accentuated by the report, will reportedly ask Treasury to consider certain proposals.

Treasury Secretary Humphrey was not a member of the Cabinet Committee on Minerals Policy, although he did act as a consultant. So the Committee's view on tax revision needs are not binding on him.

The Committee cited last year's increase in depletion allowances as a progressive move to aid mining, but did not specify what other changes in the tax law should be made. Interior is considering such proposals as these: additional increases in depletion allowances, tax exemption for new mines for a period subsequent to first profitable operations, elimination of limitations on deductibility for exploration costs.

The success of such proposals is questionable in view of the Administration's intention to extend the present rate of corporate taxes. Best tax prospect for mining appears in a proposed change in Treasury regulations, requiring no Congressional approval, which would allow faster write-offs on capital equipment.

• **Interior should draft revisions in the mining laws for submission to Congress, which would encourage the use of newer methods of exploration.** Most experts feel exploration has been hindered by the lack of clarity in claims on property investigated with new geophysical and geo-chemical techniques.

Other changes in the mining laws, mentioned briefly in this column last month, will probably rate more priority since they have already been initiated in Congress. A new bill is almost certain to be introduced this year to open up for mineral development more than 7-million acres of public land now withdrawn or reserved for power development or power sites.

Rep. Engle, new chairman of the House Interior Committee, introduced such a bill in the last session. It passed the House, was reported by the Senate Interior Committee, but failed to get action on the Senate floor. Several Congressmen have called this "must" legislation.

Another proposed bill would prevent abuses under the mining law by persons who locate claims on public land for purposes other than legitimate mining. Last year, the House Interior Committee reported a bill by former Rep. D'Ewart, which made plain that such land use is illegal.

The D'Ewart bill was bottled up, however, when the House Agriculture Committee reported a bill by Rep. Hope, also aimed to curb abuses under the mining law, which placed some new restrictions on mine claims. Main ones were the transfer of considerable authority over mining claims on public lands to the Forest Service and retention of title to timber for the Government. Mining spokesmen denounced the Hope bill, called it a "departure from historic regulations promoting mining."

The House Rules Committee directed the Agriculture and Interior Committees to resolve the conflict.

LABOR THIS MONTH

Alan E. Adams, McGraw-Hill Washington News Bureau

LEFT-WING UNIONS RUN FOR COVER: Legal assaults and loss of members are forcing Communist-controlled labor unions to seek refuge in the major labor federations. The idea is to team up with either the AFL or CIO and gain virtual immunity from the new Communist Control Act. That law specifically exempts affiliates of both federations from coming Justice Department drive to break up the Red-led labor groups—at least until the suspected unions are taken to task. (This provision was put in to block opposition to the law by the AFL and CIO.)

HERE'S THE STRATEGY:

• The Fur and Leather Workers Union disposed of its president, Ben Gold, following his conviction and immediately made overtures to join the AFL Meatcutters Union. The Fur Union's plan to team up with the AFL—including all fur officers—was okayed by the leadership of the meat union. But the AFL high command, led by President George Meany, condemned the move with the statement: "The proposed merger, with the Amalgamated taking in the Fur and Leather Workers lock, stock and barrel, including many well-known Communists in key positions of leadership, in no way meets the problem of Communist domination from the viewpoint of the AFL."

While the proposed merger was under way, one right-wing local of the Fur Union appealed to the CIO for a charter, promising to secede from the International Union if the CIO would take them in. The CIO quickly approved the request, moving hastily to beat the merger move which would put the Fur Union under the AFL-CIO No-Raiding Pact and prevent the secession. The pact bars switching of members from one federation to another.

• The left-wing Mine-Mill and Smelter Workers Union is making peace feelers to AFL and CIO unions which have been raiding its ranks. MMSW officials are appealing to the CIO steelworkers and AFL mine unions to team up for bargaining as the first step "on the road to real unity." Joint bargaining, Mine-Mill claims, will prevent non-ferrous mine companies from "playing one union against the other."

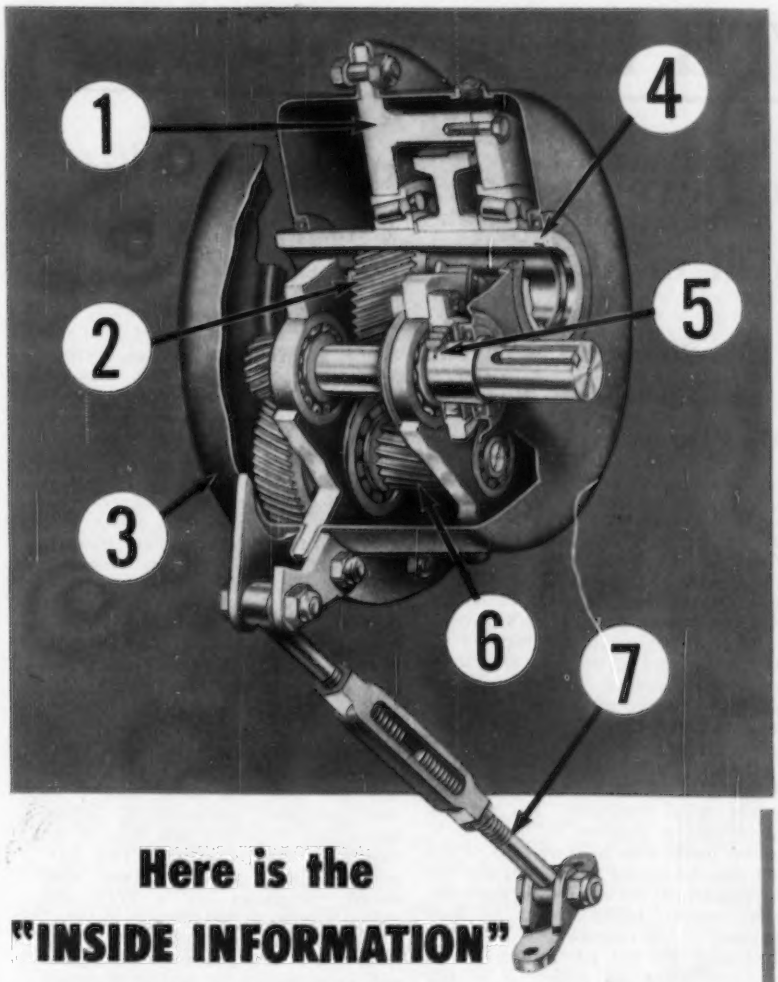
However, MMSW rivals aren't buying. They're more than content to leave Mine-Mill independent and susceptible to drives to take over representation at Mine-Mill strongholds.

The CIO gives the clue to the attempted affiliation moves of the Communist-controlled unions. Latest CIO figures on the 11 unions it expelled five years ago on charges of Communist-domination show their membership has dropped from 1.5-million to less than 300-thousand. CIO Secretary-Treasurer James Carey says "The orphaning of the Communist-led unions has dried up the the prime source of Communist revenue and forced the curtailment of many of the party's activities."

GOVERNMENT PRESSES RED-UNIONS ATTACK: The Justice Department is determined to complete the break-up of Communist unions through the Communist Control Act. One of the first to be hit will be Mine-Mill. But from the time the Attorney General makes his first move, it will be at least two years before the Government can disband the union. Court fights will take up the time.

Meanwhile, U. S. attorneys in Denver are pushing the case against MMSW Secretary-Treasurer Maurice J. Travis who has been indicted for filing a false Taft-Hartley Law non-Communist oath. Mine-Mill, as an example of the fight it will put up against Federal action in Washington is collecting a war-chest to defend Travis. A referendum is being conducted among Mine-Mill membership on a plan to raise local dues from $1 to $2.50. Mine-Mill officials also want to hike the per capita tax paid to the International for each local member. These funds will be used for the Travis defense, but the Government questions whether that can legally be done. There may be a fight on this issue alone.

SIGNS OF THE FUTURE: There's talk in Mine-Mill circles about organizing the post-war phenomenon—the uranium miner. But this is a long way off. Uranium operations aren't industrialized sufficiently for union organization. Most of the uranium diggers resemble the old-time prospectors trying to strike it rich.



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Take a careful look inside the Falk all-steel Shaft Mounted Drive, and you will know why this newest member of the famous Falk family is ideal for applications where direct mounting on the driven shaft is desirable. It is the only drive in its field with all these superior "In-built" factors:—

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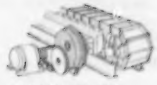
A FEW TYPICAL APPLICATIONS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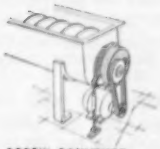
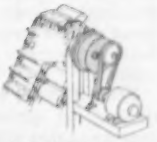

SCREW CONVEYOR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THIS MONTH IN MINING

Republic Steel To Develop New Huge Rutile Deposit in Mexico

Some 25-Million Tons of 15%-20% Ore Proven; Monthly Equipment Valued at $1.3-Million Needed; Output of 2,000 Tons of TiO_2 Planned.

REPUBLIC STEEL CORP., Cleveland, has proved up a minimum of 25-million metric tons of rich rutile ore on its 7-mi long by 1½-mi wide 38 adjoining claims in the state of Oaxaca, Mexico.

Republic Steel acquired the initial 8 of its present 38 claims in April 1953 after Donald Gillies, its 82-yr-young mining consultant, assisted by metallurgist Ward Broadfield and practical mining engineer, and Willis Seaman, Michigan geologist, personally combed the mountainous area and satisfied themselves and Republic officials the rutile outcroppings led to an orebody of tremendous size.

Proving the orebody has been the work of a field force during the past year and the size of the proven body makes it the largest known rutile orebody in the Americas. When its extent is finally determined, it could possibly be the largest in existence.

Republic Steel, late in December, started placing orders for mining and 250 tpd concentrating equipment, all of which can be bought off the manufacturer's shelf, and at a cost of about $1.3-million, including a 1000 hp diesel electric generator as the power unit. All of the equipment and material is to be delivered in Oaxaca, nearest suitable rail depot to the mine, well in advance of June, the start of the five months' rainy season.

From Oaxaca the equipment must be trucked the approximate 134 mi, much over mountain roads with the last 20 mi totally unimproved.

Production is expected to get under way in 1955 with the plant producing 2,000 tons of titanium oxide, rutile concentrate, per month by January 1956. The concentrate will be water-shipped from Port Angel, on the Pacific Coast, to U. S. refiners and processors. Republic Steel has no present plans for refining the concentrate, or titanium dioxide, for the titanium pure metal but will expand its activities in processing the metal, a field in which it is a pioneer.

The ore is said to average 15 to 20% rutile. The ruby red ore is hard but brittle and lies in three bands, the first being about 500 ft from the summit of an 8500 ft high mountain which is part of the Sierra Madre Occidental chain. The bands are from 75 ft to more than 200 ft wide and average 40 ft in thickness. Outcroppings, found by casual surface explorations on Republic's property 5 mi from the initial discovery on the Tisur claim, are of the same analysis as to material content, leading field engineers to believe the bands extend, by folds though with occasional dikes, the length of the property.

The ore will be crushed to 40 mesh, then milled to 60 to 80 mesh before gravity spiral separation. The resulting concentrate is expected to be 95% titanium oxide. Five to seven tons of ore will thus be needed to produce one ton of concentrate. Present proven ore eventually means 4-million tons of pure titanium, it was estimated.

Between 500 and 800 natives will be employed when the project is in full operation. Ward Broadfield has been named general manager. Name of the mine is Mina Guadalupe de Tisur, post office address is Plume Hidalgo, Oaxaca, Mexico.

Total Republic Steel investment reportedly will be U.S. $10 to U.S. $15-million.

Press reports said that no one knows for sure how much rutile is located on the 38 claims but quoted Gillies as saying that "a conservative estimate" would be about 400-million tons.

Gillies, who has been in mining since 1883, was retired from active work with Republic in his mid-70's. He refused to accept an idle retirement, as the location of the discovery attests.

Republic's present campsite was cleared by almost literally blowing off the top of a mountain and setting natives to leveling an adequate area. The camp now consists of a bunk house, cook shack and a dormitory for some 35 workers. It is located atop a 4500-ft mountain, some 120 air miles south of Oaxaca City.

Looking about him at the forbidding mountain wilderness, Seaman commented, "We've got only two directions around here—up and down."

Defense officials consider titanium a must for jets and supersonic aircraft.

U. S. Sulphur Output Establishes New High

U. S. SULPHUR industry in 1954 broke all previous production records with an estimated output of 6.6-million long tons.

This estimate was released by Langbourne M. Williams, president, Freeport Sulphur Co., who added that, "The sulphur industry begins 1955 in a strong position to supply the needs of consumers. Productive capacity is ample to meet all demands, both domestic and foreign."

The 6.6-million production was 350,000 tons more than was produced in 1953. Most of this production, Williams said, came from 13 salt dome deposits in Texas and Louisiana mined.

Williams gave this breakdown of the total tonnage figure: An estimated 5,450,000 tons was produced by the Frasch process; 350,000 tons was recovered from gases; 400,000 tons was contained in pyrites, and another 400,000 tons was reclaimed from other sources.

Output of Frasch sulphur was about 300,000 tons more than in 1953. Williams said this gain was made possible by "the successful operation of Garden Island Bay, Freeport's new mine at the mouth of the Mississippi. This $14-million mining plant," Williams continued, "completed late in 1953, produced in excess of 500,000 tons in 1954."

Ten projects for recovery of sulphur from sour natural gas and refinery gases and for production of sulphur in various other forms went into production or neared completion in 1954. Plans for 1955 include a new Frasch operation at Chacahoula Dome in Louisiana and eight other various projects.

Cleveland-Cliffs to Build Iron Agglomerating Plant

CLEVELAND-CLIFFS Iron Co. announced Dec. 29 that McDowell Co. of Cleveland, contractors and engineers, has been awarded a contract to construct an agglomerating plant for Cleveland-Cliffs' Republic Mine near Marquette, Michigan.

The 2,000 tpd plant will pelletize high-grade iron concentrates from the jasper formation by the so-called updraft traveling grate process. Republic Mine, slated for production late in 1955, is geared for initial annual output of 500,000 tons. This is about twice that of the Humboldt plant, Cleveland-Cliffs first venture in developing and concentrating Michigan's low-grade hematite (see *E&MJ*, August 1954, p 100). Republic plant will have two unusual features: an agglomerating disc named "ballwell flying saucer" and an updraft traveling grate capable of producing 2,000 gross tons of pellets daily.

Fifty Minnesota Mines Pass 10-Million Ton Shipping Mark; Big Reserves Still Untapped

E. S. Tillinghast

E&MJ Iron Country Correspondent

AT THE BEGINNING OF THE 1954 SEASON there were fifty Minnesota mines that had shipped a total of 10-million tons or more. Of these, 26 are operated by the Oliver Iron Mining Division; eight by Pickands, Mather & Co.; five by Cleveland-Cliffs Iron Co.; two each by M. A. Hanna Co., Jones & Laughlin Steel Corp., Minnesota Mining Division (one of the two in conjunction with Pacific Isle Mining Co.), Snyder Mining Co., and Republic Steel Corp.; and one each by Pacific Isle Mining Co., E. A. Young, Inc., and F. L. Palarine (lessee).

These fifty mines, during their operating years, have shipped a total of 1,386,070,295 tons out of total Minnesota shipments up to 1954 of 2,097,291,595 tons (exclusive of the 2,364,446 tons shipped from the M. A. Hanna Co.'s group of small mines in Fillmore County) or over 66%. During the 70 years since 1884 more than 400 mines—large and small—have contributed to Minnesota's huge shipments.

For the 1953 season these 50 mines made shipments of 31,473,738 tons, or 38.6% of total Minnesota production of 81,511,479 tons for the year, coming from 227 properties. The drop in the proportionate shipments of the 50 mines was due, at least in a great measure, to the heavy demands made upon them during two world wars.

In spite of their large production records, this group of mines has an estimated reserve of 192,146,231 tons, or a little more than 23% of Minnesota's iron ore reserves. Estimates of ore remaining in these 50 mines may be increased as the trend toward utilization of lower grade crude ores continues and with the employment of new and more efficient methods of beneficiation. By present estimates, 10 of the 50 now show less than 1-million tons of available ore. Two of the properties, the Hull-Rust (Hull) and the Mahoning, have exceeded 100-million tons in total shipments. The Hull-Rust (Rust), listed separately, has produced the impressive total of 83,430,298 tons up to 1954.

Four of the 53 on the Vermilion Range and one on the Mesabi have made all their production from underground: the Pioneer, Soudan and Zenith on the Vermilion and the Godfrey on the Mesabi. The pioneer is well ahead of the other three in total tonnage with 31,333,924 tons. It made its largest shipment in 1953 (895,588 tons) and had about 8-million tons still available at the beginning of 1954.

Second largest producer of the four has been the Zenith (18,794,075 tons) operated by Pickands, Mather & Co. and with nearly 2-million tons remaining. The Pioneer, Soudan and Godfrey are Oliver Iron Mining Division operations. The Godfrey shows the largest reserve of the four with over 10-million tons at the date of comparison.

Of the 50 mines which make up the group only one is shown as "exhausted": the Burt mine of the Oliver, but several are approaching that state unless new ore or lower grade ore can be added to available tonnage. Only four of the 50 show more than 10-million tons remaining.

Only two of the 50, at the end of the 1953 season, had more ore remaining than they had shipped: the Embarrass (Pickands, Mather & Co.) and the Monroe-Tener (Oliver Iron Mining Division). The Cuyuna Range is represented by the Portsmouth mine of the M. A. Hanna Co. which has shipped 13,013,539 tons and the Vermilion Range by the three underground mines previously noted. The other 46 mines are on the Mesabi Range.

Ten of the 50 shipped over 1-million tons in 1953, the largest shipper being the Monroe-Tener at 2,855,635 tons. The Shenango, after 50 yr of production, sent out 11,154 tons. Two mines, the Burt and the Grant, made no shipment in 1953, the Burt being exhausted.

Three mines of the 50 have shipped over 1-million tons per year for the past ten years—the Embarrass, Mahoning and Mountain Iron—the first two operated by Pickands, Mather & Co. and the last by the Oliver.

Some former large producers, like the Hull, the Rust, the Hill-Annex, the Monroe-Tener and others, failed to make this record because of decreased shipments for only a few years.

New mines will be added each year to the list of those which have exceeded 10-million tons in shipments and others will join the "exhausted" group—a finish which eventually overtakes every mine unless it is abandoned while still retaining a remnant of its ore because the cost of mining it is greater than its value. This quite frequently occurs, especially in underground mines, when the pumping load is heavy.

Some properties, yet unopened, will be found on such a list of the future; but the record of 110,123,194 tons from the Hull-Rust (Hull mine)—in addition to the 83,430,298 tons of the Hull-Rust (Rust mine)—and the 100,459,009 Mahoning mine tons will probably not be surpassed by other Minnesota iron mines for many years.

News Highlights

Discovery of four new uranium areas has been announced by the California State Division of Mines. **Page 124.**

Climax Uranium Co. has signed a new 5-yr contract with AEC to double the capacity of its uranium processing mill at Grand Junction. **Page 126.**

Vanadium Corporation of America has begun work on its fourth major expansion project on the Colorado Plateau in less than 2 yr. **Page 130.**

Hecla Mining Co. and Bunker Hill & Sullivan Mining & Concentrating Co. have concluded a $1,058,366 DMEA contract for deep-level exploration of the Silver Mountain Lead Mines property. **Page 134.**

Next April 1, the lease on Oliver Iron Mining Division's Sibley Mine on the Vermilion Range will be canceled. **Page 138.**

Sunshine Mining Co., of Kellogg, Idaho, has made a trial shipment from its tungsten property at Storm Lake, Montana. **Page 142.**

Between 2,000 and 4,000 tons of ore a day are being shipped from Anaconda's Jackpile Mine in New Mexico, railroad men report. **Page 144.**

International Smelting & Refining Co. has resumed limited operation of its Tooele lead-zinc concentrator in Utah. **Page 148.**

Production is starting this month at the 6500-ton concentrator at Noranda's Gaspe Copper Mines. **Page 153.**

Ontario's Blind River area has become one of Canada's busiest exploration spots. **Page 154.**

Discussion of the fluorspar situation and some details on Asarco's Agujita operation in Mexico. **Page 159.**

Two more South African gold mines have been scheduled as uranium producers. **Page 162.**

An "important discovery" of a previously unsuspected connection between uranium and occurrences and certain surface rock types may prove a boon to prospectors, according to one Australian source. **Page 164.**

Spodumene mining has begun at Ravensthorpe in Western Australia and an initial shipment has been made to Europe. **Page 167.**

Otanmaeki iron mine in northern Finland expects to produce 250,000 tons of concentrates in 1955. **Page 170.**

Occurrence of uranium in Philippines ores has been reported by Philippine Iron Mines, largest iron ore producer in that country. **Page 170.**

CONVEYOR BELT will lead ore from crusher in pit to secondary crusher on surface.

National Gypsum Co.'s New Open Pit Mine Preparing for Spring Operation at Halifax

EXCAVATION at National Gypsum Co.'s new gypsum open pit mine near Halifax, Nova Scotia, has reached the pit floor 80 ft below the surface of the ground. A primary crusher will be located on the pit floor, and from this the rock will go by conveyor belt to the surface to a secondary crusher—then by conveyor belt to a 10,000 ton surge stockpile and on by conveyor to the car loader.

The deposit of gypsum at the mine site reportedly is 300 ft deep. It lies beneath 8 to 40 ft of overburden. First block scheduled for mining measures 2,000 by 3,000 ft and will be mined to a depth of 70 ft. This particular block was selected by company geologists because it offers the highest quality gypsum with the least overburden. This first block is expected to furnish a 30 yr supply.

Working in the same area, the company could go on to four succeeding levels each 70 ft deep without running out of rock, company officials said. There is said to be additional gypsum of almost equal quality surrounding the entire area.

The company's $6-million project, started last summer and expected to be completed next spring, includes the mine and rail facilities at Milford, Nova Scotia, dock and loading facilities at Dartmouth, across the Bay from Halifax, and a 30-mi rail spur between.

Discovered by company geologists, the extensive new deposits will supply National Gypsum's four eastern seaboard gypsum plants at Portsmouth, N. H., New York City, Baltimore and Savannah. Capacity of these plants has been expanded 25% to absorb the additional supplies of gypsum. The Halifax development will be a year 'round operation. It is expected to furnish a higher quality supply of raw material at lower cost.

According to Melvin H. Baker, National Gypsum chairman, the new development may be the precursor of manufacturing facilities in the Canadian market, where the company is not now represented.

AEC Circular Termination

ATOMIC ENERGY COMMISSION on Dec. 12 terminated effectiveness of Domestic Uranium Program Circular No. 7, pertaining to leasing of lands for uranium prospecting.

Mining Calendar

National Western Mining Meeting and Annual Meeting, Colorado Mining Association, Feb. 3-5, Shirley Savoy Hotel, Denver.

AIME, Annual Meeting, Feb. 14-17, Hotel Conrad Hilton, Chicago.

Ninth Western Metal Congress & Exposition, March 28-April 1, Los Angeles.

Canadian Institute of Mining and Metallurgy, Annual Meeting, April 19-21, Royal York Hotel, Toronto.

B. C.'s Mineral Potential Praised at CIMM Meeting

NORTHERN BRITISH COLUMBIA presents as attractive a field for exploration as any in Canada today, H. De Witt Smith of Newmont Mining Corp. of New York and president-elect of American Institute of Mining and Metallurgical Engineers, stated at annual western conference of Canadian Institute of Mining and Metallurgy in Vancouver.

He told the more than 500 leaders of mining industry in Canada that his observations were offered "as an interested outsider who has had close associations with Canadian mining operations over the past 25 years.

"The growth of mineral production of Canada over past quarter century has been phenomenal, from $280,000 (Canadian) in 1930 to $1,350,000,000 last year, an increase of 375%," he pointed out.

C. C. Huston, president of CIMM, told delegates that he considered the challenge of mining in Canada an exciting one, filled with hard work but also with promise of rich reward, especially now that use of geophysical equipment is enabling the mining engineer to peer ever deeper through the earth's crust.

Dr. G. C. Monture, chief of mineral resources section of Mines Branch, Ottawa, told conference that impact of international developments and of technical advances on the mining industry was greater than ever because of the growing awareness of importance of mineral resources to preparedness program and pointed out that U. S. is set on a course of first making that country self-sufficient as possible in the necessary metals and minerals, and secondly, of assuring access and supplies within the zone of western hemisphere influence.

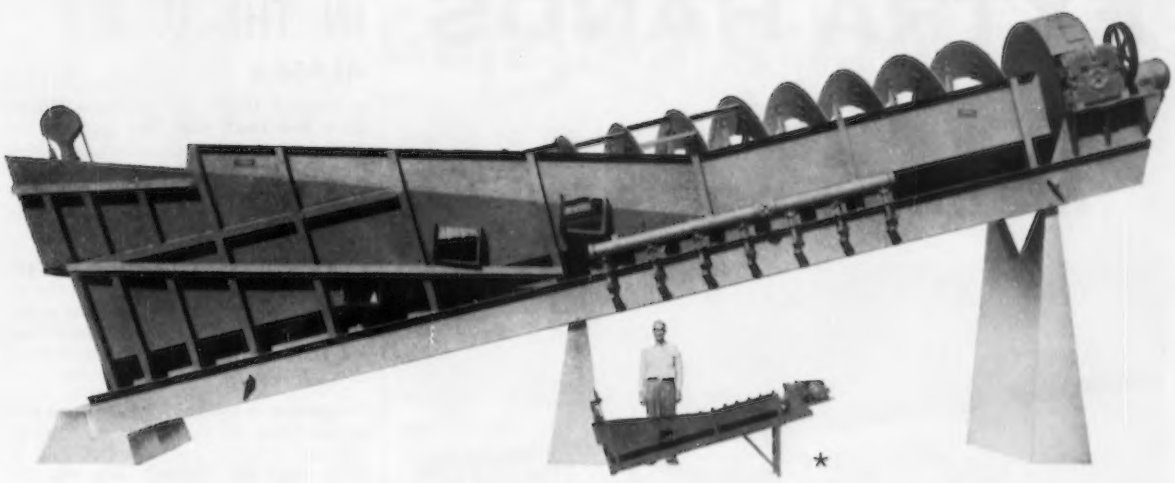
Dr. R. N. Grace, director of Alberta Research Council said that in his opinion there's a great future ahead for the coal industry and that charges by some mining men that "coal is finished" because of steady decline in production can't be upheld.

There are still many fortunes to be made in Canadian mining, according to Clifford S. Lord, chief geologist of Geological Survey of Canada.

"Just look at the discoveries made in past two years and remember that most of these were in the southern third of Canada. That leaves most of the far north wide open for exploration by energetic and enthusiastic prospectors."

Statement that 18 mines in British Columbia have been forced to close down since provincial government amended the tax structure in 1952, was vehemently challenged by Mines Minister Robert Sommers.

E. C. Roper, president of B. C. Mining Association and head of Britannia Mining and Smelting Co. Ltd., said earlier in November that 18 mines have already suspended operations because of provincial government's tax policies and "alarming" reports of the closure of other important mines next year were being heard.



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IN THE U. S.

ALASKA

In October DeCoursey Mountain Mining Co.'s Red Devil Mine was listed as the leading United States mercury producer. This mine was listed first alphabetically in a list of the top 10 producers. It is not necessarily the leading producer in volume.

Exploration drifting is continuing at Admiralty Alaska Mining Co.'s nickel-copper deposit at Funter Bay. Another 4,000 ft of diamond drilling is planned. and invitations to bid on the work have been circulated among drilling concerns.

Prospecting in the Shirley Lake area, 110 mi northeast of Anchorage, is continuing, and at least one diamond drill is being employed. Shirley Lake was the scene of a recent small uranium rush. The drill is one of the Canadian "Packsack" diamond drills, and Alaskans are awaiting a report on its performance.

ARIZONA

Universal Uranium & Milling Corp. announced purchase of 300 uranium claims near Marble Canyon, in a deal involving $250,000.

Company spokesmen said the claims have several thousand tons of ore that can be removed by open pit mining. Surface assays reportedly show an average of .70% uranium.

Universal holds more than 700 claims elsewhere on the Colorado Plateau.

Capitol Uranium Co., with headquarters in Farmington, N. M., reported 16 shipments of uranium ore had been made from its Carrizo Mountain property in Apache, Ariz. Shipments averaged $75.96 a ton, spokesmen said.

Capitol said the AEC is core drilling its Lukachukai Mountains property, also in Apache County.

Pinal Copper & Uranium Corp., has been capitalized in Arizona for an authorized $30-million and has development work under way 43 mi southwest of Casa Grande in Pinal County.

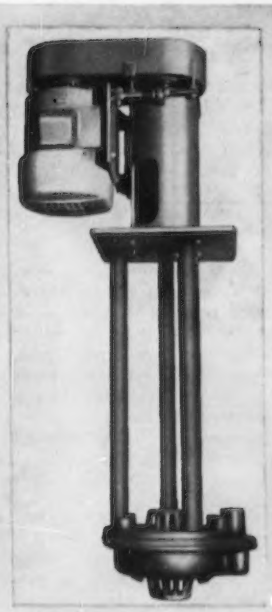
A Phoenix engineering firm has estimated the working to be the largest orebody discovered since the New Cornelia Mine at Ajo.

Edward Hopkins, president, says the copper orebody consists of 54 claims and contains an estimated 1.8-million tons of copper. Hopkins is owner and operator of the Hopkins Land Co., Phoenix.

In addition to the copper orebody, the company also has claims on uranium territory, at the intersection of Cherry and Ash Creeks 45 mi north of Globe. A test of the uranium ore was said to run around .20 of 1%.

The copper workings will be open pit. P. H. Lund Engineering Corp. of Phoenix reported the copper ore showed an average content of 2.60%.

Arizona copper wages are up from 11 to 230% over 1941, the department of min-



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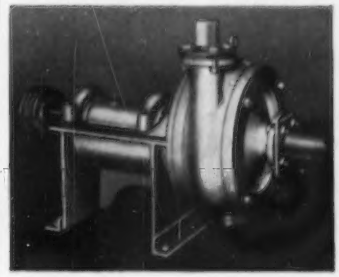

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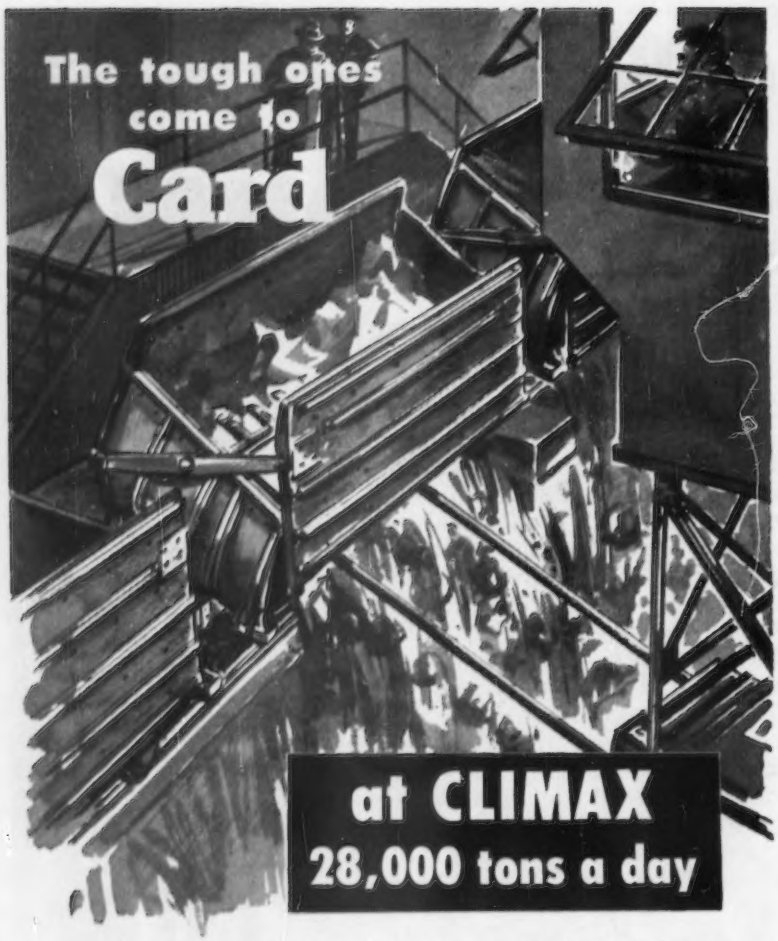

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Arizona (*Continued*)

eral resources reports. Some of the contrasts are: laborer, from $3.95 to $13.12; helper, from $5.83 to $14.28; operator, from $6.51 to $15.88; brakeman, from $5.47 to $15.32; journeyman, from $7.07 to $16.40; engineer, from $7.07 to $16.92; shovel operator, from $5.95 to $19.04.

Water needs for mine, mill and camp uses in developing the Artillery Peak manganese ores in Mohave County can be met, the Geological Survey reports.

The deposits have been described as one of the largest low-grade manganese bodies in the nation. According to surveys, the area can handle industrial and domestic needs for a community of 1,500 by construction of a sub-surface dam, a surface dam and reservoir.

Papago Indians have renewed their fight to obtain mineral rights to their 2-million acre reservation. The reservation was established in 1916 with a provision withholding from the Indians any mineral rights. At present there are 410 claims covering 11,000 acres and with large-scale uranium search in the area, the Papagos want to be cut into a share of any future revenue.

The state reportedly is going out after $100,000 a year which it says it hasn't been getting on mineral royalties on state land.

Roger Ernst, State Land Commissioner at Phoenix, noted that law required 5% of the net value of minerals produced and said he will start civil action to recover unpaid royalties.

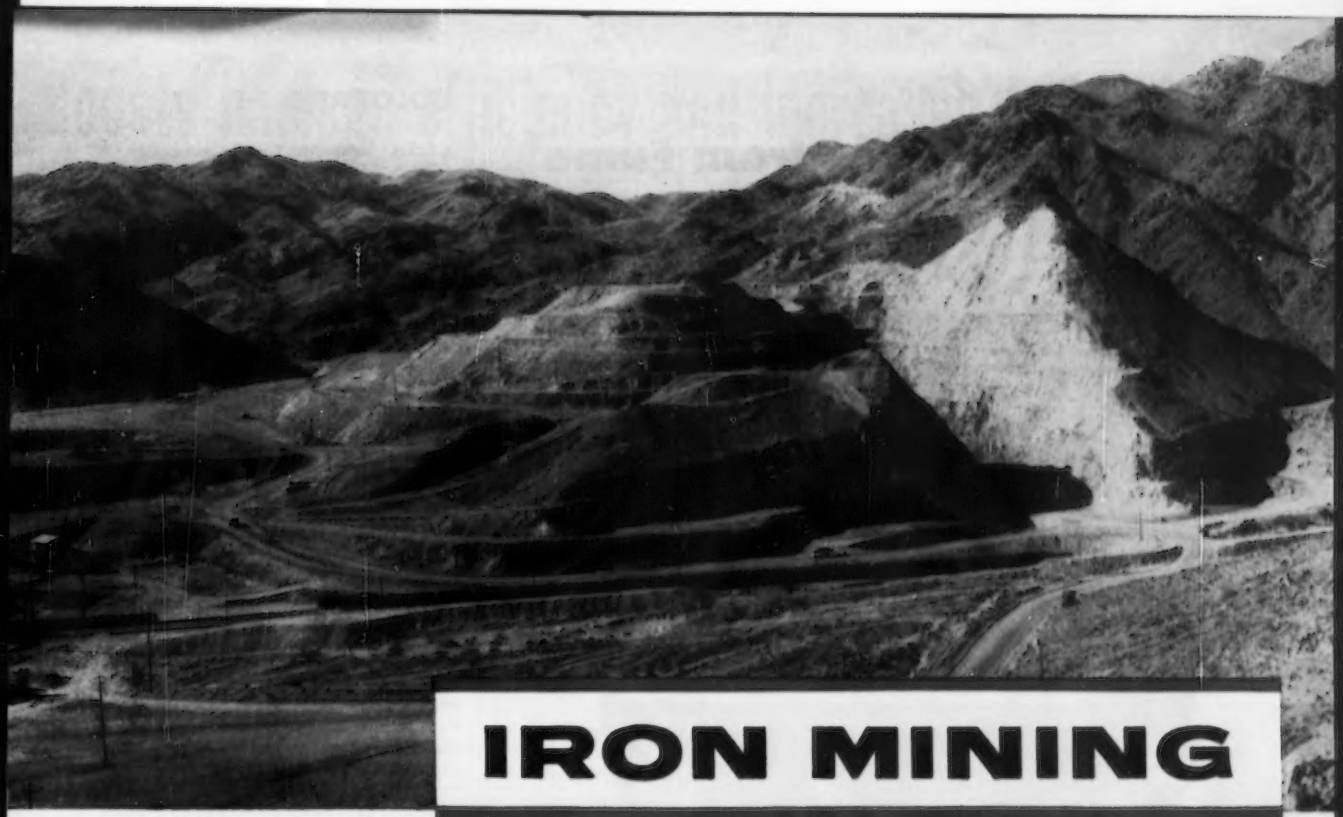
CALIFORNIA

Idaho-Maryland Mines Corp has applied for a DMEA loan for tungsten exploration at its Grass Valley mine. The company hopes to start soon on an exploration program in excess of $100,000. Gold mining operations at the property are being carried on by 130 men. Work has progressed to the 3280-ft level, according to Bert Austin, president.

California Quicksilver Mines Inc., is adding a second 40-ton furnace at the Abbott Mine in Lake County. It is expected to boost mill capacity to 300 flasks a month.

Exploration carried on under a $90,000 DMEA contract resulted in discovery of a new orebody that is expected to provide work for two years. Some 35-40 men are employed at the mine.

Discovery of four new uranium areas has been announced by the state division of mines. They are: 1) Erskine Creek, east of Isabella in Kern County—quartzite float impregnated with gummite; 2) McKittrick-Taft area in Kern County—autunite, torbernite, and carnotite; 3) Liebre Mountains, southeast of Gorman in the Quail quadrangle in the Ridge Basin area of Los Angeles County—uraniferous carbonaceous shale beds and lignite; 4) Kelso Valley east of Isabella—autunite and torbernite.



General view of Kaiser Iron Mine at Eagle Mountain, California.

IRON MINING
In California

22 ton "Euc" with quarry body being loaded by 5 cu. yd. shovel.

Dumping 22 tons of ore into crusher for processing and rail shipment to Fontana Plant of Kaiser Steel Corporation.

Kaiser Steel Uses "Eucs"

IRON ORE for the big Kaiser Steel plant at Fontana, California, comes from an open pit mine in the Eagle Mountains between Indio and Blythe. Mining operations began in July of 1948 with 11 Rear-Dump "Eucs" of 15-ton capacity removing overburden, stockpiling low grade material and hauling top grade ore from loading shovels to the main crusher.

Performance of the original Euclid fleet was so dependable and efficient that Kaiser now uses 15 "Eucs" of 22-ton capacity with 5 of the 15-ton units. Loading shovels have 4½ and 5 cu. yd. buckets . . . hauls from bench to crusher have long grades of minus 8%. Despite big loads and steep downhill hauls, speed is controlled without excessive use of the service brakes by means of retarding units that maintain maximum safe travel speeds at all times.

If you have a problem of moving large tonnages on tough off-the-highway hauls, ask your nearby Euclid distributor for helpful facts and figures. He may be able to help you reduce costs, and besides, he's a good man to know!

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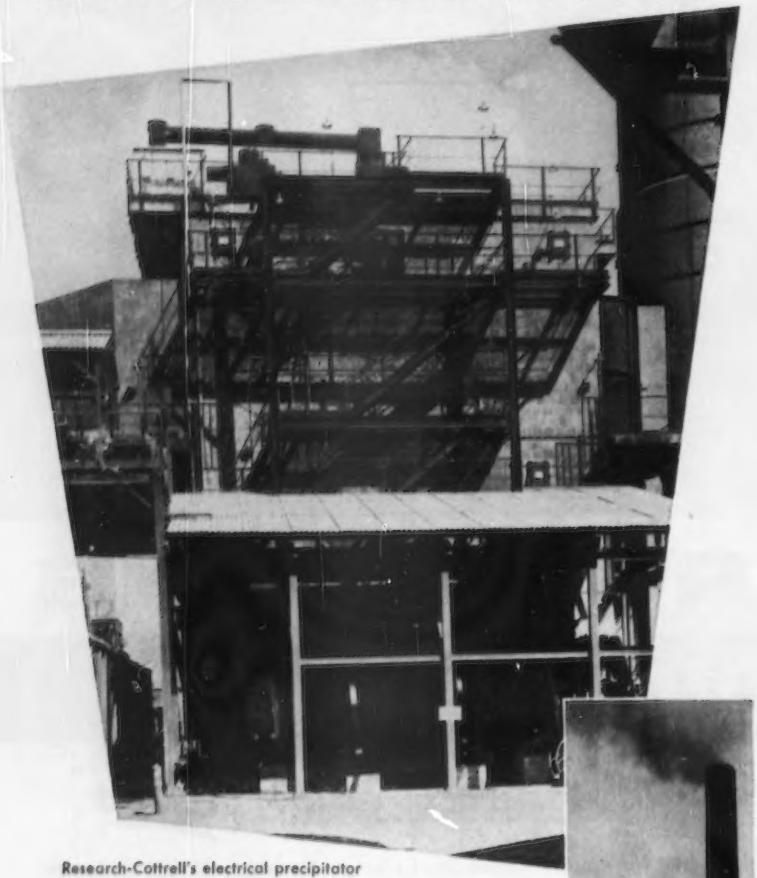
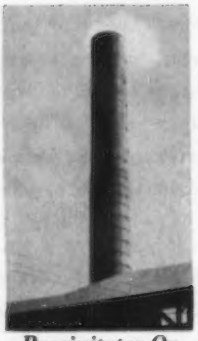


Research-Cottrell's electrical precipitator installation at the Palmerton, Pa. plant.

Precipitator Off



Precipitator On

The two photographs (right) show the results of this Research-Cottrell installation. The smoke in the picture at the top (Precipitator Off) consists of dry dust and fume entrained in the zinc ore sintering machine gases.

The picture at the bottom (Precipitator On) shows nothing but water vapor escaping from the same stack.

If you have a fume problem that involves recovering valuable materials that are going up the stack or combating a smoke nuisance, get in touch with your nearest Research-Cottrell representative. His experience with over 300 roaster and metallurgical precipitators will enable him to advise you on the most effective—and economical solution to your problem.

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COLORADO

Climax Uranium Co. a subsidiary of Climax Molybdenum Co., has signed a new 5-yr contract with the Atomic Energy Commission to double the capacity of its uranium processing mill at Grand Junction.

Climax Uranium has been experimenting with an improved process during the past year that has been tested thoroughly on a pilot plant basis. The expanded mill will incorporate this more efficient process, it is reported.

Uranium prospecting is getting into full swing in Moffat, Rio Blanco and Routt Counties with local people by the hundreds getting into the prospecting act. There is enough high grade ore in the area to add impetus to the prospecting boom.

On Uranium Mountain, high grade ore is now on a production basis. Ore from Uranium Mountain is mined and trucked to Rifle for refining.

United Mining & Leasing Corp. of Central City, reports it has discovered uraninite ore on the 250 ft level in the Carroll mine and is preparing to develop the Two Sister, Spur Daisy and others of its 21 claims on Nigger Hill a mile beyond the northwest city limits.

United now is doing preliminary processing of its ores in the leased Black Eagle mill at Idaho Springs to salvage lead, zinc, silver and gold values. Samples of ore from the Carroll have assayed as high as 36.2 in uranium oxide. Van R. McKay is president, Claude McKay, manager.

Edwin Arbar, Jr., student at Western State College in Gunnison, and a resident of Red Cliff reportedly has discovered a vein showing uranium ore, in the Holy Cross Mining district, 21 mi from Red Cliff. Atomic Energy Commission has shown interest.

An assay test on 375 lb of surface ore is said to have shown a .734% to 2.105% uranium oxide. The type of uranium mineral now exposed is autunite, a secondary uranium mineral of pitchblende.

Rocky Mountain Standard Inc., Boulder, announces it has developed and is in process of patenting a uranium concentration plant.

The company is preparing to construct a portable plant that may be moved about similar to oil field rotary drilling rigs. The plant is so designed that it will process uranium ore deposited in sandstone of a content as low as .05% uranium oxide, profitably. It is believed the process may enable uranium miners to recover much ore now going to the waste pile.

Two gold bricks, No.'s 213 and 214, were poured at Golden Cycle mill for a gross value of $50,500. About 10,000 tons of ore were purchased for the month of October with the higher values coming from the Golden Cycle's Ajax and the Cresson Mine.

Some of the flotation cells are being

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The M.S.A. MinePhone is eliminating communication delays in mines everywhere. This clear, instant two-way voice communication system coordinates the wide variety of operations vital to peak production. Haulage moves faster because dispatcher and motormen are constantly in touch, even while trips are in motion. Shop and maintenance personnel are always "on call." And because messages are relayed instantly, on an open-line hookup, underground safety is increased. Write for details.

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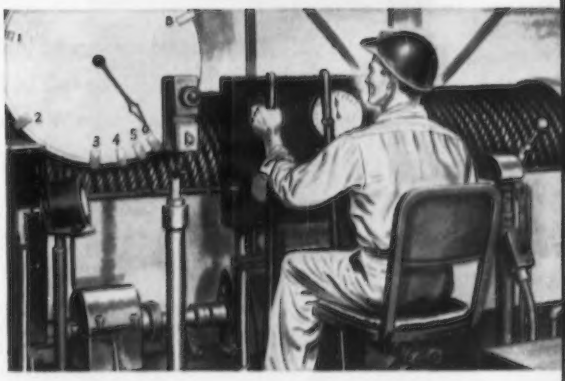

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Colorado *(Continued)*

increased in size and new mechanisms installed in an experiment to increase the efficiency of the flotation process.

Climax Molybdenum Co. at Climax set an all-time daily production record of 32,565 of ore tons in September. Phillipson level production was 20,890 tons and Storke Level was 11,675 tons. Climax is the largest underground mine in the United States, with a 1953 tonnage mined at 6,604,857.

Construction has started on a new crushing and sampling plant at the Climax Uranium Co. mill in Grand Junction, according to Marvin Kay, vice president and general manager of Climax. Contract for design and construction of the new facility was let to Western-Knapp Engineering Co., San Francisco.

Minerals Mining & Milling Co. at Rico started operation of its mill recently. When running at full capacity, the mill will handle 100 tons a day, producing lead, silver, concentrate.

Ore comes from property which the company has under lease from Union Carbide & Carbon Co. Ken Erickson is manager and also acts as mill superintendent. Eddie Baer is mine superintendent.

The seventh uranium plant expansion on the Colorado Plateau since last May has been announced by the Atomic Energy Commission operations office at Grand Junction.

The latest work provided in an amended contract between the AEC and the Vanadium Corp. of America provides for increasing the capacity of VCA's plant at Naturita, in the center of the Uravan mineral belt in southwestern Colorado. The additional facilities are expected to be in operation in early 1955. The AEC does not disclose uranium production or processing figures.

Other plant expansions the past eight months on the plateau were two at the Grants, N. M., plant of Anaconda Copper Mining Co.; Salt Lake City plant of Vitro Uranium Co.; Durango, Colo., plant of Vanadium Corp. of America; Grand Junction, plant of Climax Uranium Co., and the Federal government plant at Monticello, Utah.

First shipment of uranium ore from the White Crow lease in Montrose County was made by Dome Uranium Mines Inc. The lease, in Little Gyp Basin, is being operated by Loren Jewell of Rifle for Dome.

Gold has been struck in Courthouse Square, right in the heart of Denver.

William A. Zeckendorf, president of Webb & Knapp, announced in November plans for a $35-million hotel and business development on Courthouse Square. And he disclosed at the same time that part of the excavation cost will be paid by panning raw gold from the sand to be removed—sand which once was the bed of gold-laden Cherry Creek.

Denver's Mayor Quigg Newton immediately ordered City Attorney John Banks

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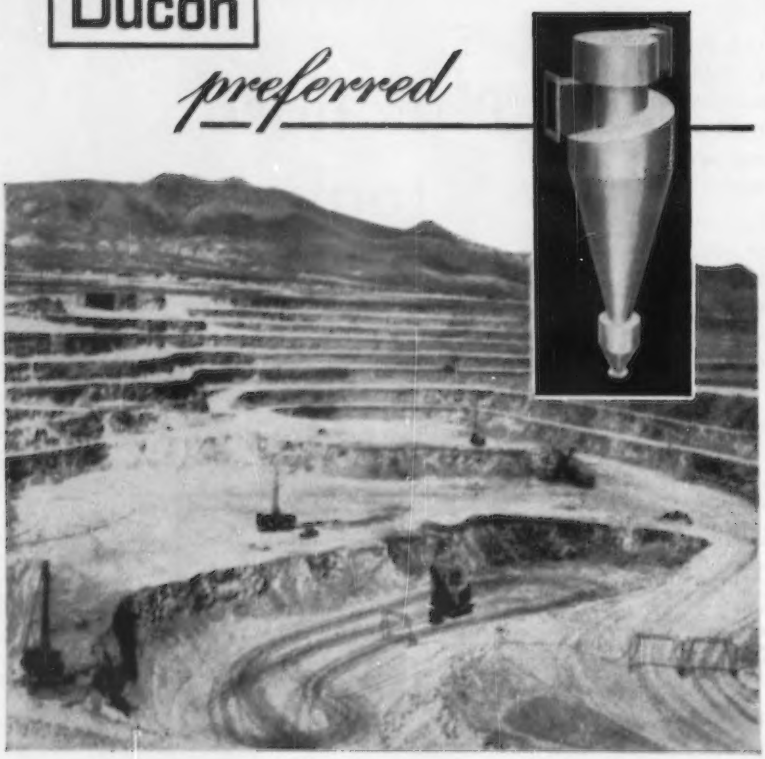

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Colorado *(Continued)*

to look into the matter, to see if the city might be able to claim "a few bucketfuls of nuggets" because of a street under which Zeckendorf must dig.

Whether or not the city gets any of the Courthouse Square gold, it's expecting to cash in on a rich uranium strike made last summer in the South Platte river canyon near Waterton, on city water department property.

Colorado mineral production in 1953, not including uranium or manganese, totaled $211,670,000, according to a U. S. Bureau of Mines report.

John H. East Jr., regional chief of the Bureau, said the total represented a $24-million increase over 1952. He credited the advance to increased production of petroleum, molybdenum, vanadium, fluorspar, tungsten, clay, sand and gravel, and to increased prices for some minerals.

Molybdenum production, solely at the Climax mine in Lake County, was up 56% over 1952—to 33.74-million lb. Gold production was down 4%, silver 22%, copper 18%, lead 28% and zinc 29%.

Shipments of tungsten concentrate increased 30%; beryl production was up almost a third, and fluorspar was up 83%.

Vanadium Corporation of America has begun work on its fourth major expansion project on the Colorado Plateau in less than 2 yr.

D. W. Viles

Under construction at VCA's Naturita plant is a new roaster. D. W. Viles, vice president in charge of mining operations, said the new roaster will increase the plant's capacity by 30%, and bring the Naturita payroll to about 150. Construction is expected to be completed in March. The new facility will give VCA three roasters, with a smaller one in reserve, at Naturita.

Contract for the new expansion was signed by VCA and the Atomic Energy Commission late in November. Earlier in the month VCA placed in operation a new roaster at its Durango mill.

Telluride Mines Inc. announced $1.5-million will be spent to reconstruct the zinc and lead ore processing plant at Pandora and press a program of "extensive underground development."

John S. Wish, general manager, said ore should be coming out at the rate of 38,000 tons a month by early 1956.

The company had closed down its Telluride operation early in 1954. Word of the reopening plans came as a welcome pre-Christmas gift to the town, which has no steady livelihood other than mining.

Telluride Mines Inc. is a sub-division of Idarado Mining Co.

Fortune Uranium Corp. officials said

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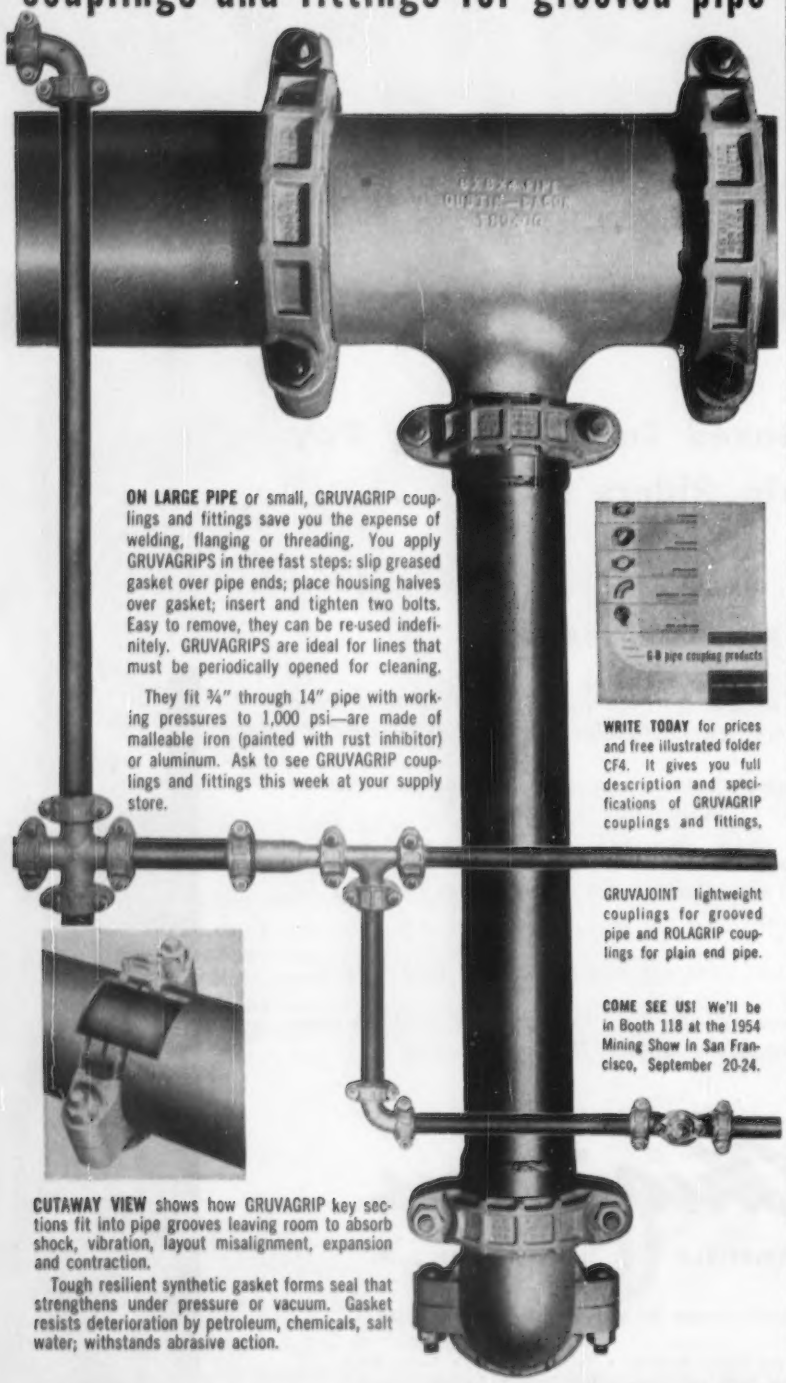

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Colorado *(Continued)*

their operation will be shipping 1,000 tons of ore a month to Uravan by February.

Michael McGrath, company geologist, has estimated that three Fortune claims contain 2.5-million tons of commercial ore that will average $50 a ton, plus bonus.

E. J. Cusack and L. W. Hiser, operating as Uranium Enterprises, have begun development of claims in the unproven area on Junction Creek northwest of Durango.

Martin B. Semands of Conroe, Tex., has arranged for equipment to operate a uranium prospect in La Plata canyon, once the scene of much gold activity, west of Durango.

United Mining & Leasing Corp. reported discovery of an uraninite orebody on the 260-ft level of its Carroll Mine near Central City. Initial shipment of ore for processing at Grand Junction yielded a uranium oxide content of .49%.

The company also is operating its Two Sisters Mine near Central City. A shipment of 600 lb of torbernite from the old Two Sisters dump averaged 1.88% uranium oxide.

Prospects for gold mining are anything but rosy, A. H. Shoemaker, general manager of the Homestake Mining Co. of Lead, S. D., told the Denver chapter of the American Institute of Mining & Metallurgical Engineers at a recent dinner meeting.

Big question in the gold mining industry is how to stay in business, rather than how to increase profits, Shoemaker said.

He added that it is "only a matter of time" before all primary gold production halts unless the price of gold is increased, or costs of mining and milling go down.

More than 1,000 uranium hunters joined in a claim-staking stampede in western Montrose County as about 21,000 acres of land were restored for prospecting after being withdrawn in 1951 by the AEC.

Several hundred stakers camped all night in the area, in order to post location notices as soon as staking became legal at 10 am on opening day. Some shots were heard, but no casualties were reported. County officials recorded over 2,000 claims and predicted a field day for lawyers later on as staking errors are uncovered.

One company at least was optimistic over its acquisitions in the "rush." Norbute Corp. officials said that firm obtained 26 claims "in the more favorable area of drilling" completed by the AEC. Norbute is the firm in which William Zeckendorf, nationally known financier, has an interest.

IDAHO

North Fork Mining Co. has opened high-grade silver-lead ore in a crosscut driven to get under a vein outcrop exposed

earlier by bulldozer trenching on its six-claim Lucky Strike property in the Beaver Mining District of the Coeur d'Alene Region north of Wallace. The vein was cut about 300 ft from the portal. Silver-to-lead ratio is about 2 to 1.

The crosscut is being continued for another 250 ft or more to probe the downward extension of other vein structures exposed at the surface.

Company also has reopened an old tunnel on the property driven by early-day gold miners and found a vein which shows commercial values in silver and lead. Because of the bad ground conditions in the old tunnel, another adit is now being driven to this orebody at a slightly higher elevation to provide room for a dump and ore bins.

North Fork holds the property under a 25-yr lease and is carrying out the exploration program under a $44,500 DMEA loan. R. H. Scanlin of Port Angeles, Wash., is general manager.

Lookout Mountain Mining & Milling Co. of Kellogg has discovered rich uranium ore on one of its properties in southwestern Wyoming, company officials report. Some 20 ft of ore assaying more than 1% U_3O_8 was exposed on the Lost Creek group of six claims early in November and the Atomic Energy Commission has undertaken an 18-hole drilling program to further explore the ground. The company has two other groups in the same general area, the Jeffrey Deam group of six claims and the Wasatch group of 16 claims.

Lookout Mountain also has joined forces with United Mines Inc., also of Kellogg, in exploration and development of a 5,000-acre prospect known as the Elk Ridge group in the White Canyon area of San Juan County, Utah.

Preliminary surveying and geological study are now in progress preparatory to starting an extensive core-drilling program. The operating contract between the two firms provides for proportionate sharing of costs and profits. Lookout Mountain will have a 37½% interest; United Mines, a 62½% interest.

Sullivan Mining Co.'s electrolytic zinc plant at Kellogg resumed full capacity production early in November after about six months of 75% operation due to the low price and poor demand for zinc.

About 60 men were added to the crew and special high-grade metal, the company's only zinc metal product, again is being turned out at the rate of 4,800 tons per month.

Officials said the action was taken because of improved demand from the die-casting industry. The price is still not entirely adequate, but appears to be fairly well stabilized, they pointed out.

DMEA has approved two more exploration loans for projects in Idaho.

T. J. Wilhite and Arthur V. Seay, both of Bismarck, N. D., will receive 75% federal aid on a $16,000 uranium exploration program involving drifting, crosscutting and raising at the Surprise property in the Dahlonega Mining District of Lemhi County.

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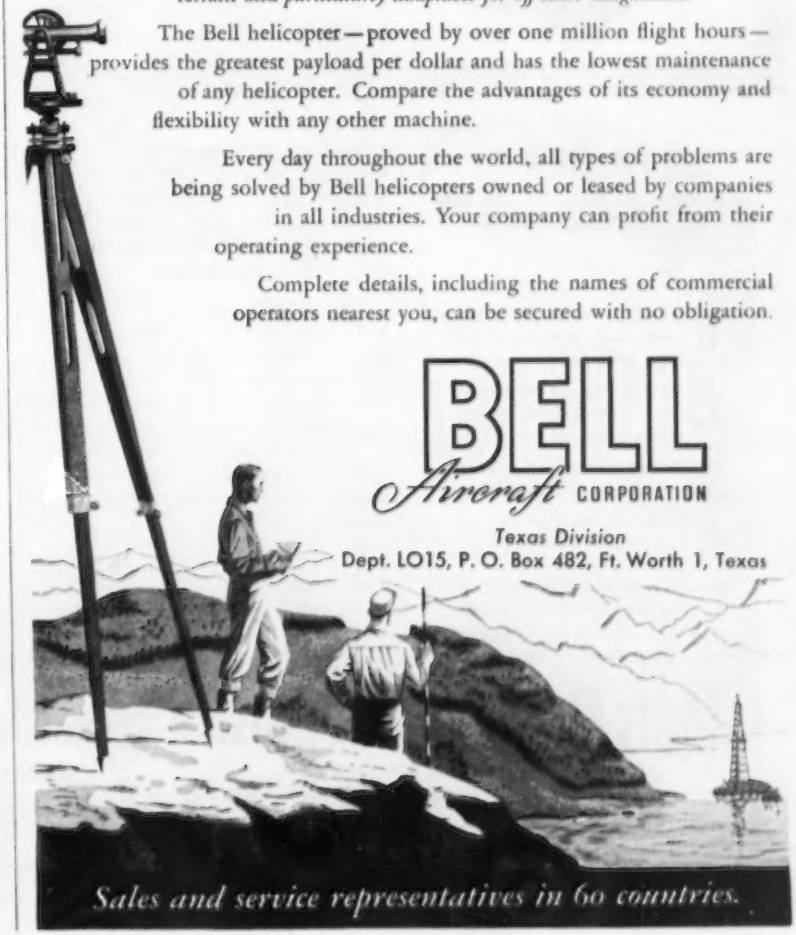

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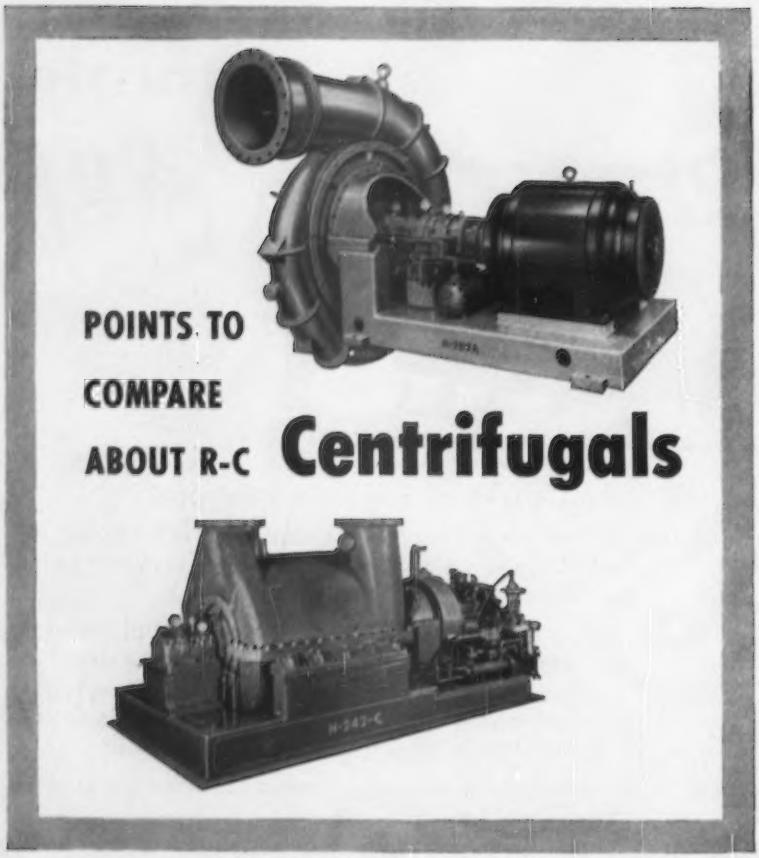

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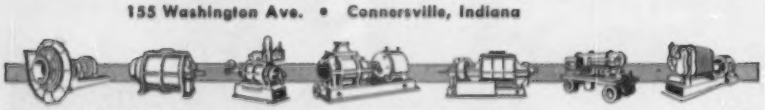

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Idaho *(Continued)*

E. H. Sowers and Stanley G. Johnson, both of Hailey, were granted a 50% loan for exploration of the Red Leaf lead-zinc property in Blaine County. Total cost of the program is estimated at $10,662.

Shaft-sinking at the Vindicator Silver-Lead property in the Coeur d'Alene District east of Mullan has been completed to the 800-ft depth objective and northerly crosscutting toward the projected position of the Vindicator vein is now in progress on the 750-ft horizon. The vein is estimated to lie between 200 and 300 ft from the shaft.

Silver Buckle Mining Co. operates the property under a profit-sharing agreement with Vindicator Silver-Lead Mines Co. and has a $229,500 DMEA contract for the shaft work and deep-level exploration.

Contractors have completed a 120-ft incline shaft in the footwall of the uranium-bearing vein on Hailey Trust's property in Blaine County west of Hailey, and within a short time the vein is expected to be opened by crosscut. It was sunk at a 45 deg angle near an old gold exploration shaft on the dump of which was found radioactive ore which assayed as high as 0.9% uraninite. Hardee Construction Co. of Casper, Wyo., is operating the property under an agreement with Hailey Trust.

Hecla Mining Co. and Bunker Hill & Sullivan Mining & Concentrating Co. have concluded a $1,058,366 contract with DMEA for deep-level exploration of the Silver Mountain Lead Mines property east of Mullan. It is the second largest contract approved to date in the Pacific Northwest. The largest was for $1,098,750 to Bunker Hill for below-sea-level exploration of its Crescent property in the silver belt on Big Creek between Wallace and Kellogg.

Project will include sinking a 2080-ft shaft and driving approximately 6400 ft of exploration drifts and crosscuts on the 2,000-ft level. Half of the cost will be financed through a DMEA loan which is repayable out of royalties on any production that may result from the work. Hecla and Bunker Hill will share the balance of the cost equally.

Work was to have been started before the end of December, and must be completed within 36 months.

The two companies took over exploration and development of the Silver Mountain 2500-acre property in June 1954, under an agreement which gives them each 37½% of any profits from production in return for financing the program. Preliminary diamond-drilling exploration has been in progress since last summer, to provide geological information necessary in planning the underground work.

Sidney Mining Co. has started deepening its 2½-compartment main shaft from the 1700 to the 2300 ft level under an $323,150 DMEA contract approved last September. Work was started in the sump 95 ft below the 1700 level. It is

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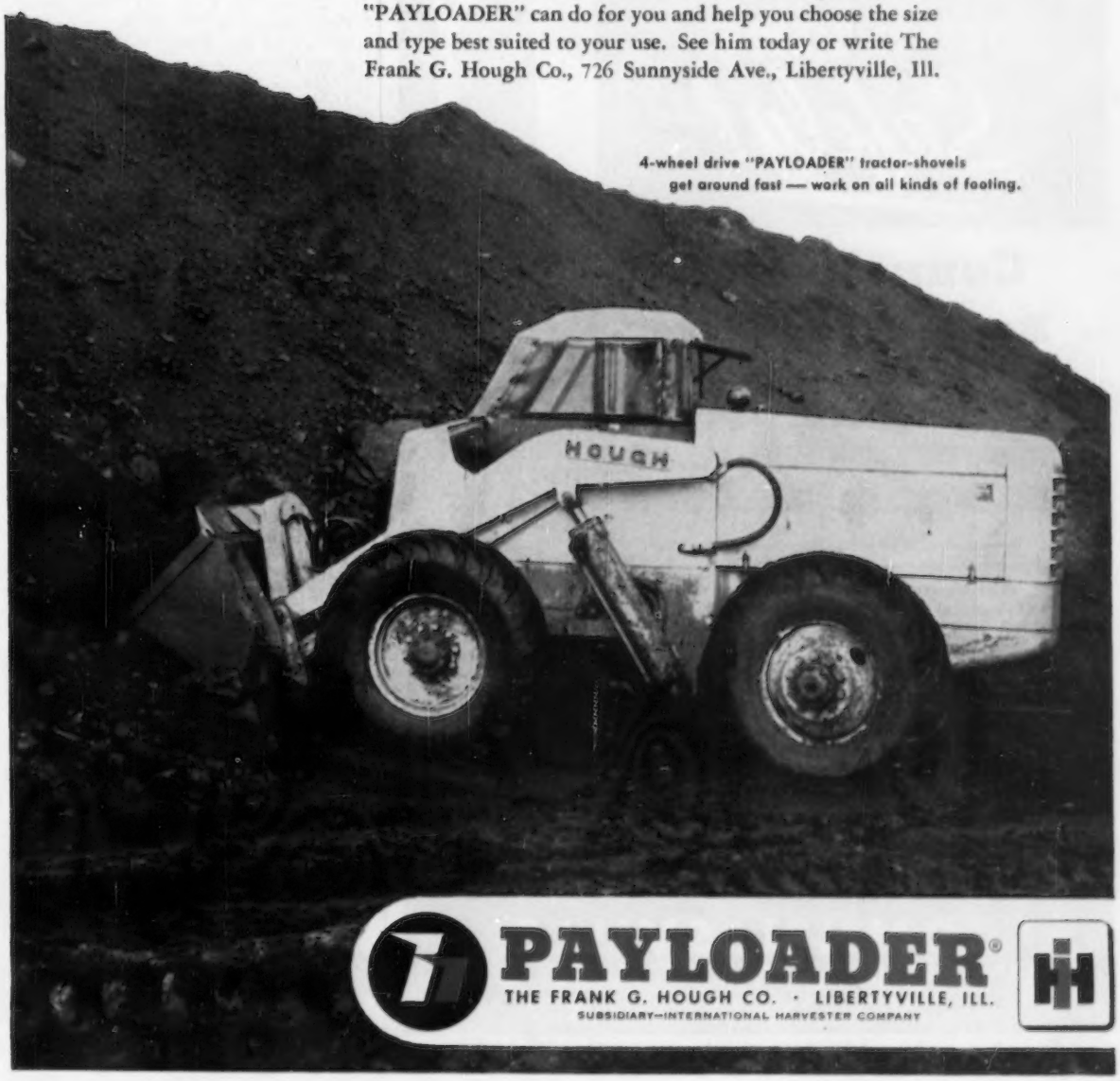

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Idaho (*Continued*)

estimated that the project will take about 10 months to complete. Lateral exploration at the new depth will then be undertaken. About 4075 ft of drifting and 12,000 ft of diamond drilling are planned.

Production from the mine has been cut to 2,800 tons a month, less than half the 1953 monthly average, and about 75% of current output is provided by leasers operating in old workings above the 900 main adit level under an incentive block-leasing system. Income from production is reported to be sufficient to cover expenses, including the company's 50% share of the DMEA project costs.

Clayton Silver Mines has encountered the downward extension of its South orebody on the new 550 level at its property in the Bayhorse District of Custer County. The crosscut toward the larger North orebody has been advanced about 600 ft, about half way to its objective. The new level, which is 170 ft deeper than the 400, is expected to open an additional 180,000 tons of reserves for mining. This is sufficient for six years of operation at the current rate of production.

Highland-Surprise Consolidated Mining Co. has disclosed substantial zinc-lead deposits on the property acquired under lease and purchase option last fall in the Stanley area of Custer County.

Surface trenching has exposed large lead and zinc-lead vein structures. The largest vein, a zinc-lead deposit, averages at least 35 ft in width and has been traced for a distance of at least 200 ft on the surface. Sample assays show an average 9% zinc, 2% lead and 1 oz of silver per ton.

Sludge from a drilling to a depth of 300 ft on this structure shows approximately the same values. A 6-ft lead vein assaying 11.3% lead, 8.8% zinc and 3.3 oz silver per ton at the outcrop has not yet been tested by drilling.

Two other properties east and south of the one explored have been acquired by the Highland-Surprise firm under lease and purchase option, and open adjoining ground has been staked by mineral location. All the properties acquired are reported to have strong surface indications and mineralized outcrops.

Exploration work has been discontinued because of adverse weather conditions. In the meantime the company plans to start drill-testing work on its 29-claim uranium prospect in the Henry Mountains area of Garfield County, Utah.

At the company's mining and milling operation in the Pine Creek District of the Coeur d'Alenes, workings below the 1000-ft level are being abandoned, and the small amount of ore remaining above the horizon will be turned over to leasing operations.

Metropolitan Mines Corp. has diversified its operations by acquiring a uranium prospect on Poison Springs canyon in Garfield County, Utah, and taking an option on an old lead-zinc operation in the Burke canyon of the Coeur d'Alene District.

The uranium property is in the Chinle-Shinarump formation which can be prospected by shallow drilling.

The lead-zinc option involves controlling interest in a 12-yr lease on the old Black Bear Mine. The mine has a substantial record of production mostly from leasing operations above the main adit level. The downward extension of the orebody has never been explored.

Great Northern Uranium Mines Co., a new Grangeville corporation, is planning a large-scale dredging operation on 1040-acre placer holdings in central Idaho County near Elk City.

By next summer the company expects to have three draglines and a magnetic separation plant in operation. Recoveries of gold, monazite, zircon, garnet, ilmenite, samarskite, quartz and other minerals are expected to be made from the 4,150,000 cu yd of dredgable placer gravels on the property.

High-grade silver-lead ore has been opened by leasers workings above the 300 level in the old United Idaho Mine at Gilmore in Lemhi County. The first shipment of less than 50 tons assayed 31% lead, and 13 oz of silver, with minor values in zinc and gold, for a gross value of $3,365. The orebody is 8 ft

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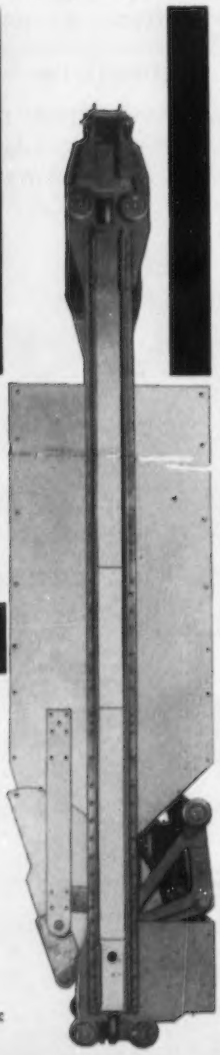

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Why this feeder doesn't cave in

● The reason is simply this: *The* PIONEER-ORO *Feeder is the most rugged feeder ever built.*

Take a look at its massive pans . . . cast from a special wear-resistant manganese steel, heavily ribbed, reinforced, and all the way from 3/16" to 1" thick, depending on width of feeder. The pans are supported by heavy, closely-spaced manganese steel rollers, keyed 3 to a heavy diameter shaft. Each shaft turns in 3 heavy-duty bearings rigidly supported on the feeder frame.

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The PIONEER-ORO is designed for the roughest, toughest feeding jobs on earth. It withstands the impact of the heaviest dump loads. It shrugs off abrasion from hard ores, slag, flintrock, granite, and other coarse, heavy materials.

But the mighty PIONEER-ORO offers more than sheer, brute strength. It is a smooth-running, finely engineered unit designed to deliver a constant flow of heavy, abrasive material, with a minimum of maintenance. Even preventive maintenance costs are low.

Rivetless pans overlap and interlock

Pans, for example, overlap and interlock to provide added stability and stop leakage and spilling. Upturned end flanges also reduce loss of material. Drive links are cast as an integral part of the pan, so there are *no bolts or rivets that can loosen.* Easily replaced link bushings need no lubrication.

Sprocket teeth are readily reversed or replaced without taking the sprocket hub from the shaft or even disconnecting the pans. Like all other wearing parts, these teeth are cast from special wear-resistant manganese alloyed steel.

Supporting rollers and shafts can be removed, too, without disturbing the pans.

OTHER FEATURES

1. Patented lugs in pan links remove dirt, make links self-cleaning.
2. Feeder can be made to run in either forward or reverse direction.
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4. Made with 6", 9", 12" or 15" pan pitch (depending on width) to fit available head room.

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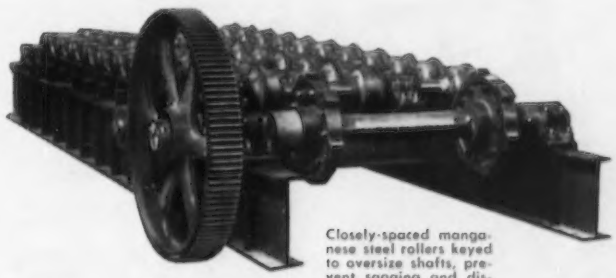
Capacities in tons per hour

Travel per Min.	Width of feeder						
	30"	36"	42"	48"	60"	72"	84"
10'	74	108	147	192	300	432	588
15'	112	162	222	289	450	648	888
20'	148	216	294	384	600	864	1176
25'	186	270	368	482	750	1080	1472
30'	223	324	442	577	900	1296	1768

Ask Your Feeder Salesman These Questions

1. Are pans made from special manganese steel? How thick?
2. Are pans and links cast together so they are rivetless?
3. Can manganese parts be replaced without disassembling pans?
4. Will pans support themselves without rollers?



Closely-spaced manganese steel rollers keyed to oversize shafts, prevent sagging and distortion of pans.

Note the turned-up end flanges and corrugated surface of heavy-interlocked pans; also absence of rivets.

For further details and specifications regarding full line of PIONEER *Feeders, write Pioneer Engineering Works, Inc., Minneapolis 13, Minn. (subsidiary of Poor & Company, Chicago) or see your nearest* PIONEER *Distributor.*

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Idaho (*Continued*)

wide and has been exposed for a length of 31 ft and a height of 7 ft. Leasers are Ronald and Arthur Henderson of Gilmore and Charles Plum of Leadore.

U. & I. Uranium, Inc., operating company in the Utah uranium fields for six Kellogg mining firms, has completed its core-drilling program on the Radon group of claims in the La Sal district of San Juan County, Utah, with 31 out of 34 holes penetrating ore averaging 10 ft in thickness at a depth of about 700 ft. The orebody is said to be approximately 2400 ft long from north to south and 300 to 400 ft wide.

Operating plans are now being formulated, and at the same time preparations are being made to start core-drilling on the adjoining Hot Rock group on which U. & I. holds a 100% working interest.

Golconda Lead Mines reports that an orebody of considerable proportions has been found in old workings above the 1600 level at its property east of Wallace. Development work by drift and raise so far indicates an ore zone approximately 100 ft high and as much as 200 ft long.

Paul H. Floyd, metallurgical engineer, Mineral Recovery & Engineering Co., Osburn, reported that his November records show that his firm has received for upgrading a total of 199.9 units of WO_3 contained in 18.0 tons of bulk concentrate from the Salmon River Scheelite Corp.

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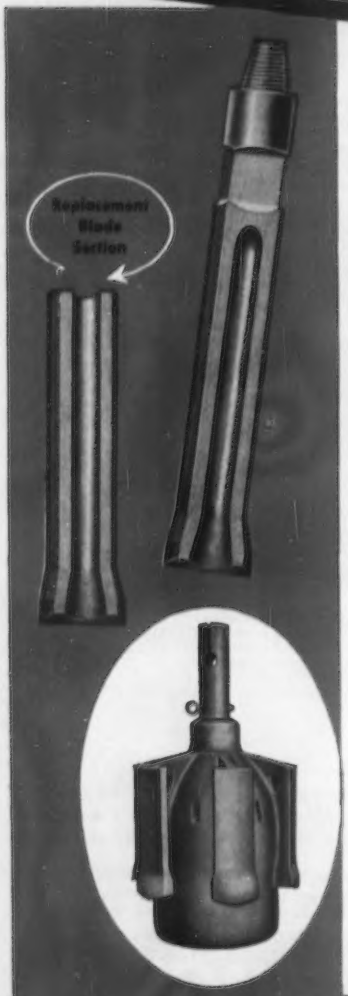

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Available also, as an added economy, are SPANG REPLACEMENT BLADE SECTIONS in the same grades of steel, and uniform forge section, for welding to pin and collar sections of original bits when long service has worn the integral blade to a point where replacement is desirable.

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MICHIGAN

Alan Broderick, chief geologist for Inland Steel Co., at a mining industry institute at Iron River, expressed the belief that the mines now producing in Iron County have enough ore "within reach" to supply normal mining operations for 30 yr at least.

He said this estimate could be expanded as time goes by. Although not many new mines have been discovered, those now producing believe that ample reserves—largely at greater depth—lie within reach of present plants.

In spite of the worst weather for outdoor construction in years, contractors for the Mackinac Bridge erection are practically on schedule. Work to date has been on the bridge's 33 concrete foundations which are more than one-third completed.

Hiawatha Mine of M. A. Hanna Co. except for maintenance and repair crews, suspended operations for one week in November during the hunting season.

Menominee Range ore shipping ended Nov. 27 and its mines have begun winter stockpiling as usual.

MINNESOTA

Blast furnace No. 2 at American Steel & Wire Division's Duluth Works, taken out of production for extensive repairs last September, resumed operation on Nov. 23. The furnace can make 300,000 tons of molten iron per year and will consume 560,000 tons of Minnesota ore annually.

The new 75 mi, 110,000 v Minnesota Power & Light transmission line from Duluth to Silver Bay has been completed and was formally dedicated Nov. 16.

The $2-million line will serve the community of Silver Bay and will provide an interchange of power with Reserve Mining Co.

Dedication ceremonies were held at M. P. & Light's substation at Reserve's taconite project power plant and were attended by officials of both companies, those of rural electric cooperatives which will be served by the new line and city officials from surrounding area towns.

Effective April 1, 1955, the lease on Oliver Iron Mining Division's Sibley Mine at Ely on the Vermilion range will be cancelled. The Sibley, an underground mine, has been operated by the Oliver since 1899. When it is added to the list of exhausted mines it will have produced a total of nearly 10-million tons.

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In the 1500 degree F. circle, formed by this battery of gas burners, is a shipper shaft pinion destined to become a vital part of a LIMA shovel. This heat, the succeeding water quench and controlled tempering process, establishes a uniform hardness up to two inches in depth to the teeth and teeth base of the pinion. This means longer serviceable life to this important part.

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1. Piston ring type dirt seal rings and retainers in crawler rollers.
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ore, rock, sand and gravel or other bulk materials become pay dirt when cost of handling is only a few cents per cu. yd. One man operates a Sauerman Scraper or Slackline Cableway—reaching out a 1000 feet or more to dig, haul and dump across pit, pond, river or stockpile—

Slackline cableway performs difficult excavation of non-caving material from deep pit. 70% rock and 30% colloidal sand posed tough digging job. Ask for Catalog C and Field Report 216.

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Drag Scraper Sizes: ⅓ to 15 cu. yds. Slacklines: ⅓ to 3½ cu. yds. Write for Field Report 203 on the actual savings effected by Sauerman equipment in an open pit mine. Other information: Catalog A, Drag Scrapers; Catalog C, Slackline Cableways; Catalog E, Bulk Storage by Power Scraper. Call on Sauerman's experienced engineers for the size and type machine best suited to your digging, hauling or materials handling requirements.

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Minnesota (*Continued*)

Minnesota Section of the AIME in November conducted a field trip to White Pine Copper Co.'s new operation at White Pine, Mich., and the Humboldt mine of Cleveland-Cliffs Iron Co., a low grade ore development which began by exploratory drilling over five years ago. During the 80's, in this area, Thomas A. Edison experimented with separating the iron magnetically. When his small plant burned down he did not rebuild it.

At the end of the 1954 shipping season, operations at the Buckeye Mine of the M. A. Hanna Co. were suspended indefinitely. A considerable tonnage of ore still remains in the property.

In addition to other winter operations, stripping is being carried on at the Cooley District mines, the South Agnew, Morton, Douglas, Mississippi, Perry and Enterprise mines of M. A. Hanna Co.

In a protest before the Minnesota State Tax Department, an attorney for the Oliver Iron Mining Division asserted that the assessed valuation of a typical Minnesota iron ore reserve increased twelve times faster than that of all other Minnesota lands during the period from 1940 to 1952.

He pointed out that the taxing of iron ore stockpiles at underground mines on ore in stock on May 1 as personal property imposes a penalty on those mining companies that provide full winter employment at such mines. Iron ore—mined or unmined—is assessed at 50% of full and true value as compared to percentages varying from 40% on urban real estate to 20% on rural homesteads. Taxation on iron ore has been subject of perennial discussion and protest for many years.

W. S. Moore Co. of Duluth has announced that it plans to open up a new mine east of Nashwauk. Its operation would necessitate the re-routing of Highway 169 from a point about 2 mi east of Nashwauk, near O'Brien Brook, to the Great Northern depot south of Nashwauk.

Importance of the taconite concentration industry to the Mesabi is indicated by the fact that $1-billion has been spent or is already earmarked for its development. It is estimated that there is sufficient taconite on the Mesabi to last for 100 yr.

Engineers' Club of Northern Minnesota held its November meeting at Chisholm. Movies were shown of the casting, transportation and erection of pre-stressed concrete members for the Tampa Bay bridge at Tampa, Florida. Arrangements for the meeting were made by R. O. Buck, Hibbing, chief engineer for the M. A. Hanna Co.

Richard Kirman, assistant superintendent of the Tioga No. 1 Mine, west of Grand Rapids, told the Chamber of Commerce of that city that the mine now employs 190 men and that the number would be increased next summer.

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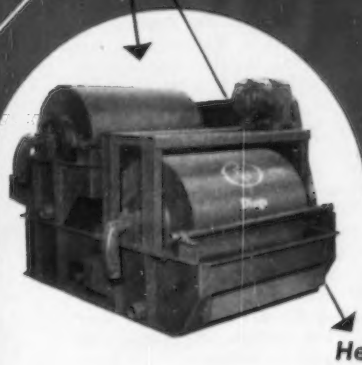
MAGNETIC SEPARATORS for TACONITE CONCENTRATION

Back in 1943, Dings Magnetic Separator Company experience and equipment was instrumental in helping to develop the commercial flow sheet that is being used by today's large taconite operators.

In 1947, Dings furnished the first high intensity "cobbing" separators to handle ball and rod mill feeds which precede the finisher separators.

This continuing research and field engineering, in conjunction with taconite company personnel, has made Dings the leading name in the wide field of magnetic separators for taconite concentration . . . including permanent magnet separators for both high intensity and medium intensity finisher duty—full width separators up to 72" in width—and now, the new double drum magnetic separator, developed specifically as a finisher separator for taconite and magnetite plants handling extremely fine feed in slurry form.



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• **No underwater spray pipes.** Water manifold provides uniform washing of concentrates *above* the water level — overcomes operators' objection to submerged sprays.

• **Tailings discharged with overflow.** This unique feature permits discharge by means of overflow, without passing through the incoming feed—maintains constant submergence of the drum, with no spigot discharges being required. Dings double drum separators consistently produce lower iron tailings.

• **More compact.** Dings unit is more compact, yet readily accessible for easier operation and extremely low maintenance.

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WC-334

Minnesota *(Continued)*

The mine is scheduled to ship about 500,000 tons of concentrates in 1955. He said that over 300,000 tons of crude ore are in stockpile ready for the beneficiation plant's opening in the spring. Pickands, Mather & Co. obtained the lease on the property in 1937. Water level in surrounding lakes is 80 ft above the surface of the ore deposit.

At a meeting of the Lake Superior Mines Safety Council at Grand Rapids Nov. 6, talks were given by F. D. Woldben, Virginia, Oliver Iron Mining Division safety supervisor; Ben Kangas, Chisholm, St. Louis County mine inspector; N. P. Arnold, Nashwauk, superintendent of maintenance for Cleveland-Cliffs Iron Mining Co.; J. Stepan and J. J. Zaverl, Duluth, of the U. S. Bureau of Mines; L. M. Bredvold, superintendent of the South Agnew and Morton mines of the M. A. Hanna Co., and S. J. Sicotte, Hibbing, retired safety supervisor for Pickands, Mather & Co.

Reserve Mining Co.'s 48 mi railroad from Silver Bay to Babbitt is well along toward completion. 140 lb rails have been laid for the entire distance and ballast has been spread. About 5½-million cu yd of material was moved for the road of which 1½-million cu yd was muskeg.

Maximum grade for loads is ½% and for empties 1½%, although it climbs 600 ft in the first 17 mi from Silver Bay and drops 188 ft in the remainder of its length. Yards at Babbitt and Silver Bay will be completed in the summer of 1955.

Shipments of iron ore on the Great Lakes ended Nov 29, when the Great Northern docks at Allouez, Wis., closed for the season. The last boat to load was the E. A. S. Clarke of the Interlake Steamship Co.

Total shipments for the season will reach between 60½- and 61-million tons, somewhat better than had been predicted. Shipments for 1953—not including Fillmore County and the Canadian ranges—were 96,317,141 tons. With the 2,716,607 tons from these two sources added the total was 99,033,748 tons.

Jones & Laughlin Steel Corp.'s Minnesota Iron Mining Division, at its Greenway-Lind Mine between Coleraine and Grand Rapids, returned the Prairie river to its original bed in November.

In October 1953, the river was diverted to a channel which had been prepared for it in order that its bank of loose sand and mud might be replaced with more impervious and well packed material down to the top of the orebody. The entire operation involved the moving of nearly 600,000 cu yd of surface. About 1700 ft of new channel was made to carry the river during the period of its diversion.

During this 13 months, piers were built in its old river bed for the permanent bridge across the Prairie that will later serve for truck haulage between pit and plant. Some of the bridge steel has been placed on the piers. The bridge will be completed next spring.

Stripping at the property has been suspended for the winter but will be resumed in early 1955.

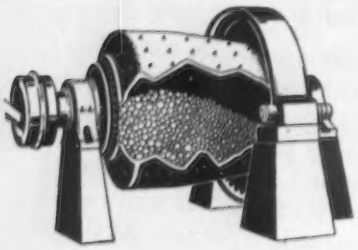
MONTANA

Sunshine Mining Co. of Kellogg, Idaho, which is developing a tungsten property at Storm Lake, south of Silver Lake, Deer Lodge County, has made a trial shipment of ore to the Contract Milling Co.'s concentrator near Butte.

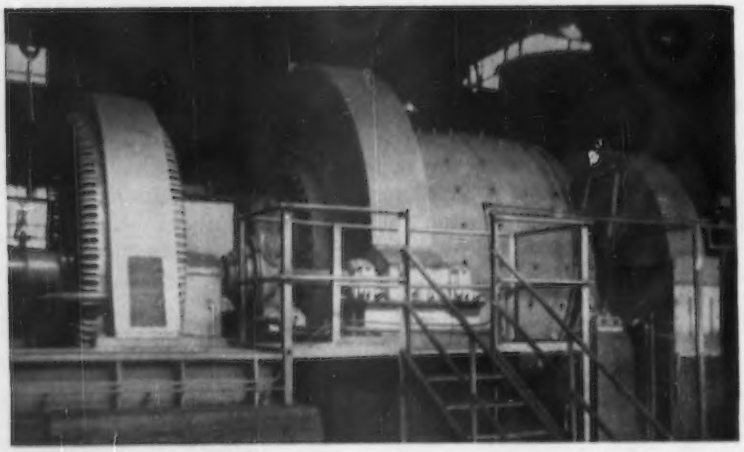
At Storm Lake Sunshine has deepened the old shaft by about 100 ft, and on the 200-ft level about 500 ft of drifting has been done as well as some diamond drilling.

Bon Terre Corp., recently organized in Spokane, is developing a tungsten property in Granite County, according to R. R. Gibson, Spokane, president and general manager. Gibson states that the company expects to mine about 50 tons of tungsten ore per day and concentrate same at Hall, Granite County.

Contract Milling Co., headed by J. Stanley Huckaba, of Spokane, has recently completed a custom mill on the Marget Ann claim of the Mitchell Min-



TRICONE MILLS



11' Hardinge Tricone Mill at Tennessee Copper Company which has produced a remarkable efficiency increase in their grinding circuit. The Tricone has many operational advantages over other types of ball mills. Write for Bulletin AH-414-1.

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ing Co. at Walkerville, north of Butte.

It is said to be milling about 75 tons per day of gold-silver-lead ore from the Marget Ann. In addition, the milling firm is accepting custom ore in limited quantities and has just received a shipment of tungsten ore from the Storm Lake Mine of the Sunshine Mining Co. of Kellogg.

Golden Anchor Mining & Milling Co. of Spokane, expects to install a simple concentrating plant to treat gold-silver-lead ore at its property near Elliston, Powell County, according to Henry L. Newmiller, president. The crushing unit of the mill is a combination of stamps and an arrastra.

Mining Association of Montana and its Helena Chapter, the Last Chance Gulch Mining Association, will hold their eleventh biennial legislative meeting and banquet in Helena, Montana, on Jan. 26, 1955.

There will be a business session in the afternoon, at which resolutions will be submitted by L. B. Manning, chairman of resolutions committee, manager of the Trout Mine, Philipsburg, and the nominations and elections committee will report and install the new officers of the Association for 1955.

In the evening, individual hosts of the mining and other industries in Montana will give a banquet and floor show, at which the members of the 34th Montana Legislative Assembly will be guests. Joseph T. Roy, superintendent of the East Helena plant of the American Smelting & Refining Co., is general chairman of the affair.

NEVADA

Shipment of 1,000 tons of sulphur from Sulphur, Nev., to Mendota, Calif., was made during November by the D. & D. Mineral Co., which has its offices in Winnemucca.

The shipment was the first in several weeks from the Humboldt County mining village.

Construction of a mill on the unit basis as ore reserves increase is planned by new leasers of the Alabama Mine near Daveytown in Humboldt County.

The property has been taken over on a lease and option agreement from B. L. Davis. Norman C. Stines is consulting engineer and general manager of the operation, and is rehabilitating the property to bring it into operation. Plans call for construction of a wholly new plant for processing the ore.

Sonoma Quicksilver Mines Inc. has recently completed construction on a 100-ton Gould Rotary furnace which is processing ore on the Turrillas property 10 mi east of Paradise Valley.

Previously completed were a cookhouse, dining room, bunkhouse, change room and power line; and the company is now on a producing basis. The work is being done by open pit method, under direction of D. A. Myers, Winnemucca, superintendent for the Sonoma operations in Humboldt County.

Deep Ruth shaft of the Nevada Mines Division of Kennecott Copper Corp. was sunk an additional 205 ft during the third quarter of 1954, increasing its depth from 1,029 to 1,234 ft.

Planned depth is 1,572 ft. A main haulage drift, to connect the Kellinski Shaft with the Ruth Shaft was extended 683 ft and has now reached a point more than half way between the two shafts.

Eureka Corp. Ltd. has reached a depth of 850 ft with its new (TL) shaft in the mine near Eureka. A station is now being cut at that point, and tentative plans call for completing the station, sinking the shaft an additional 40 ft for a sump, and then crosscutting to the orebody, heretofore outlined by drill holes, on the 850-ft level. At its present depth the shaft is making about 275 gal of water per minute.

Nevada Ore Refining Co.'s manganese refining mill 8 mi south of Reno started production during November. It is designed to produce high-grade manganese chemicals from ores not acceptable for government stockpile.

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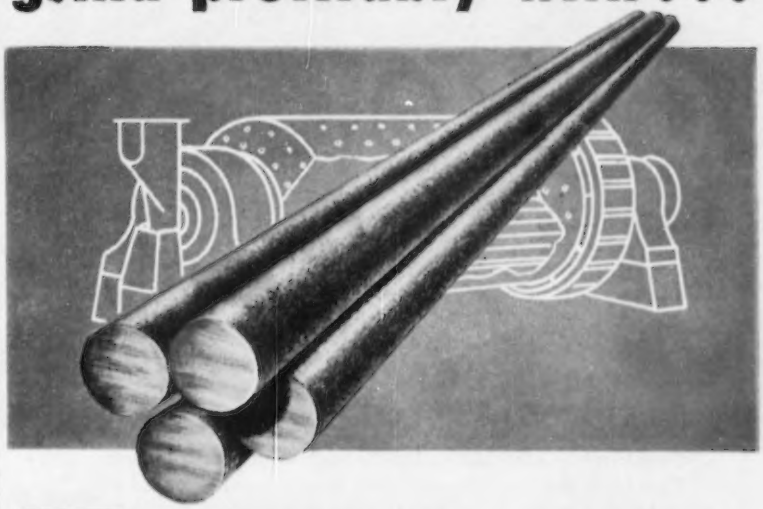

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Nevada *(Continued)*

For several months tests have been under way at the site, and the quality of the product made in the pilot plant resulted in enough orders to build a full-scale mill and begin production. Ores from deposits east of Carson City are being trucked to the plant for treatment at the rate of 50 tons daily.

J. E. Martie, of Reno, is president and general manager of the company; Dr. J. Franklin Schrum is chief engineer, Douglas Douglass is chief chemist, and Edward Morgan is chemical plant construction foreman.

The $100,000 Agri-Gyp mill at Lovelock is now in production, processing gypsum from three claims 6 mi east of the plant site which have been leased from the Southern Pacific Co.

The ore is decomposed gypsum of a high percentage and contains some sulphur and calcium. E. M. Roach is head of the operation, and 20 men are employed in a single shift operation. H. E. Peterson is plant manager and mine supervisor.

NEW MEXICO

Officials of Kerr-McGee Oil Industries Inc. inspected that company's new uranium processing plant at Shiprock late in November.

The party included Dean A. McGee of Oklahoma City, president; Tom Seale, vice president in charge of manufacturing; J. C. Finley, vice president in charge of exploration, and D. A. Watkins, chief accountant.

The Shiprock plant went into full operation about Dec. 10. Construction of the $3-million project started in February 1954.

Exploration work on 52,000 acres on which the Bolack Oil & Gas Co. of Farmington holds state uranium prospecting permits has been started by Pubco Development Inc., of Albuquerque.

Most of the land is in the Grants-Gallup area. The rest is near Lordsburg.

Tom Bolack said he will retain 25% working interest in any desirable claims located by Pubco.

Bolack's company also has leased the 13,390-acre Cubero land grant east of Grants for uranium prospecting. Anaconda Copper Mining Co.'s Jackpile mine is a few miles west of the Cubero grant, and the Santa Fe railroad's Haystack mine is about 30 mi northwest.

Between 2,000 and 4,000 tons of ore a day are being shipped from Anaconda's Jackpile mine, railroad men say. And while official information is lacking, uranium men who have workings in the area say Jackpile ore runs from .30 to .40% U_3O_8.

The mine, about 5 mi north of Laguna, has been described by Sen. Clinton P. Anderson of New Mexico as "the first multi-million ton ore deposit in the United States." F. S. Cook, assistant to the manager of Anaconda, says the mine

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New Mexico *(Continued)*

is not yet in full production, despite the heavy shipments.

Jackpile ore is covered by 100 to 120 ft of overburden. The ore zone varies in depth between 15 and 30 ft.

The ore is being stockpiled at Grants until a new mill is completed to process the sandstone which bears the uranium.

NORTH CAROLINA

Uranium prospectors staking out and filing so-called "claims" on national forest land in western North Carolina are wasting their time, and their painted corners on rocks, roadsides, and stakes constitute occupancy trespass, Don J. Morris, supervisor of North Carolina national forests, said in Asheville Dec. 2.

Those who have painted corners on rock ledges or stakes will be given a reasonable period in which to remove their marks, he said. He said that in addition to confusing the established land lines which are blazed and painted red, many of the markings are a defacement of the landscape and some of the worst examples are along Highway 181 below Jonas Ridge.

While amendments to the Atomic Energy Commission Act and the so-called "Multiple Mineral Act" of Aug. 13, 1954, apply to public domain, they do not apply to land acquired by the U. S. Government, Morris pointed out.

There are 1,122,000 acres of national forest land in North Carolina, all of which was acquired by purchase, exchange or donation. Most of it is open to prospecting for uranium, but a prospecting permit is required to dig holes or core drill, and a staked or recorded claim gives the claimant no preference whatever should he later wish to apply for a mining permit, Morris said.

Mining permits, he added, are issued by the Bureau of Mines, with applications being numbered as received by the Bureau and in case of duplicate requests, preference is given to the one bearing the smaller number. A claimant after locating a mineral, he said, should write the Bureau of Mines requesting a permit for the minimum area enclosing the vein and should define the area by a meter and bounds survey description beginning at an established land corner.

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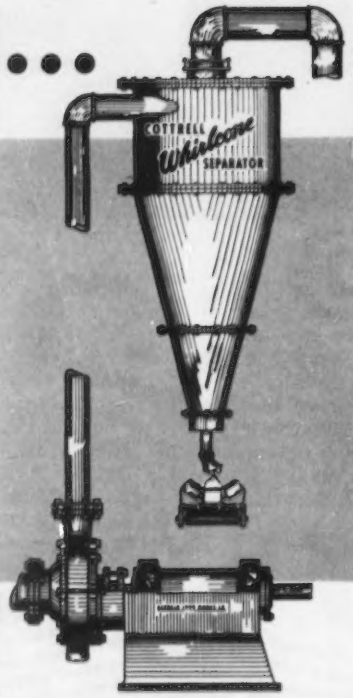

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NEW YORK

Exploration Division of the Atomic Energy Commission has assigned three men to an eastern United States reconnaissance program.

Jack Kratchman, party chief, and Arthur Richards and Gerald Gershten, geologists, make their headquarters at 70 Columbus Ave., New York. They will evaluate uranium possibilities in the eastern United States by a program of airborne scintillation counter surveys, general reconnaissance, and assistance to the public interested in prospecting for uranium in the East.

UTAH

Homestake Mining Co. has shipped the first ore from its Little Beaver Mining Co. lease in the Big Indian district, San Juan County, to the AEC mill at Monticello.

Homestake also expected to begin production about Jan. 1 on its La Sal Mining Co. lease, about 3½ mi from the Little Beaver. The three-compartment shaft on the La Sal lease, bottomed at 572 ft, was completed late in November.

Vitro Corporation of America announced at Salt Lake City it has started drilling on 57 uranium claims in the Gas Hills area of Wyoming, acquired from the Sateco Mining Co.

Jack O. Horton of Salt Lake City has been named head of Vitro's new ore and mining department.

The company also has uranium interests near the San Rafael Swell district, and in the Blind River district of Ontario, Canada.

Thousands of uranium hunters have driven over "Blue Hill," 14 mi south of Moab on U. S. Highway 160.

Right on top of the hill, only 100 ft from the highway, E. A. Vaughn kicked the dirt from under a pinion—and un-

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Utah *(Continued)*

covered carnotite. He and his partner, Lou Case, say the first seven tons ran about .80%, with hot spots as high as 5%.

They've named it the Broom mine; they use a broom and dust pan to pick up the fines.

Core drilling has been started by the Natomas Co., placer gold mining firm with headquarters at Sacramento, Calif., on 290 claims on Elk Ridge near Moab. This is the first Natomas venture in uranium.

Star Dust Mines Inc. has entered into a lease agreement with Consolidated Uranium Mines Inc. to operate the Star Dust tungsten properties at Gold Hill. Consolidated expects to spend in excess of $300,000 in development.

Production of uranium ore by Consolidated Uranium Mines Inc. has increased from 10,513 tons valued at $227,960 in 1951 to 62,588 tons valued at $1,969,445 in 1954, according to a report made public in Moab. During 1953 the company produced 36,768 tons with a gross value of $1,212,263.

Monarch Uranium Co. has made its first shipment of ore from its Freeda claims in the San Rafael Swell, Temple Mountain arear. The shipment was estimated at 3,000 lb.

Idaho-Maryland Mines Corp. has announced start of a drilling program on its uranium property near Moab. Drilling is under the supervision of Richard A. Teichman, a mining engineer.

Depth of holes will be only 80-100 ft, with wagon drilling at first and diamond drilling later, according to Bert C. Austin, president and general manager of the company. Idaho-Maryland has leased three parcels of land comprising a total of 1,165 acres.

For first time in history of the state, gold bullion has been shipped by air to New York City.

United Airlines last month carried 800 lb (Troy weight) of gold bullion from the precious metals refinery, Utah Copper Division, Kennecott Copper Corp., to a custom buyer in New York possessed of the proper Federal license to purchase.

Kennecott officials said the shipment was worth in excess of $300,000. The gold, containing minor impurities, sold for around $34 an oz.

Ordinarily, Kennecott gold travels from Utah to the Denver Mint by rail or armored truck.

Engineers for Utah Copper Division, Kennecott Copper Corp. are controlling an 8 mi sq "mud puddle," to even out flow of water and tailings to a "lake" that size serving the Arthur and Magna concentrators they are constructing a 4½-mi, 12-in. dia pipeline. Tailings now are discharged on south end of the pond.

Under the pipeline program, the tailings from the Magna mill will be dropped against the dike wall on northeast segment of the pond.

The coarse-type tailings used in the line will work as an effective sealant to prevent seepage from the "lake" onto neighboring private lands, the engineers say.

The copper firm also is working on new techniques, possibly involving use of plastic pipe, to keep down dust stirred up by hot summer winds on the ponds.

International Smelting & Refining Co. has resumed limited operation of its Tooele lead-zinc concentrator.

While the operations will be on a three turn, or shift basis, input will average around 425 tons daily—about one-third capacity of the facility.

F. A. Wardlaw, Jr., president of the Anaconda Copper Mining Co. subsidiary, said 20 day-pay workers were being rehired.

He announced also that it was a "virtual certainty" that the company's lead smelter at Tooele would be opened "sometime" in 1955. He did not designate when, however.

Reopening of the concentrator was made possible through stockpiling of ore in recent months from the United Park City Mines Co. properties, Park City district.

Operations there are gradually increasing. Some 170 miners are now working

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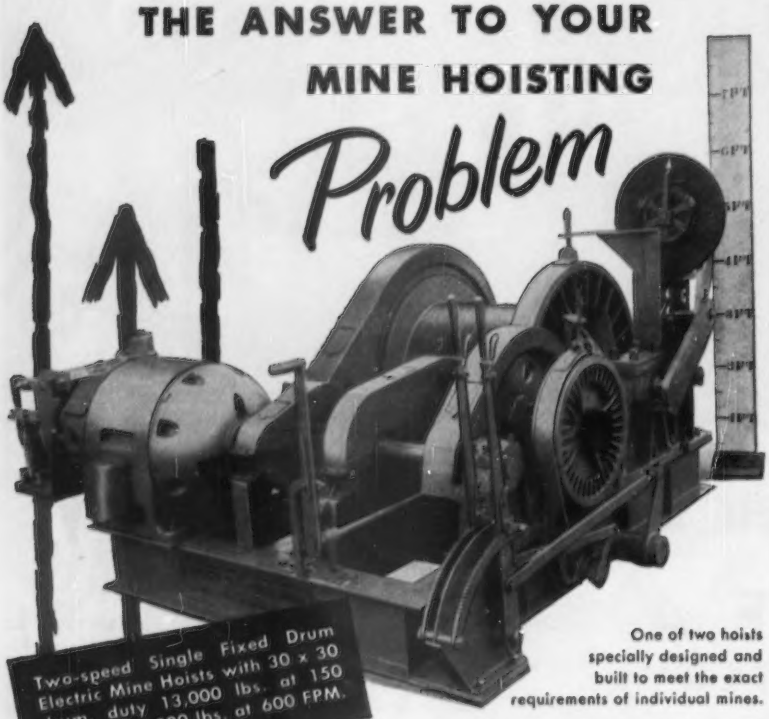

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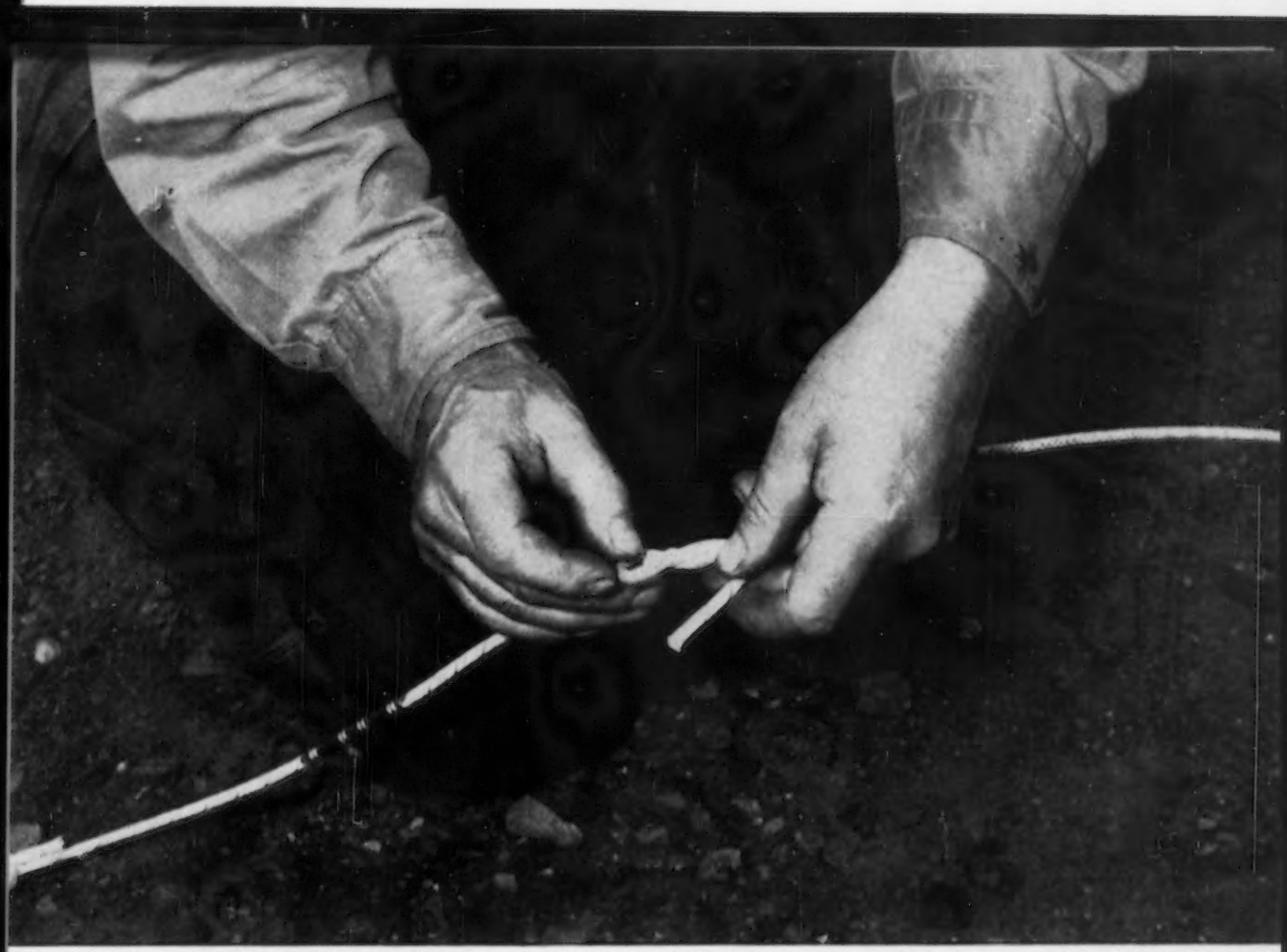

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Utah *(Continued)*

underground—as against 130 earlier in the fall.

E. J. Longyear & Co. has commenced lead-silver-zinc exploration on Hamonsville claims belonging to Chief Consolidated Mining Co. near Eureka.

The company has completed one core drill hole to a depth of about 1,069 ft. Other drillings are scheduled during the year on the claims covering about 1,000 acres.

Objective is ore deposition in a synclinal structure similar to that exploited in the past in the adjoining Tintic Standard Mining Co. properties.

Atomic Energy Commission expected that its new automatic sampling plant at Moab, would be open to all district producers for shipment by about first of January.

In December, only two shippers, Utex Exploration Corp. and a Utex lessee have been shipping to sample station stockpile across the Colorado River. They are paid 80% of value based on hand samples. These provisional shippers negotiated contracts with American Smelting & Refining Co., operators of the sampler for the AEC. The district has approximately a dozen other shippers.

Homestake Mining Co. has bottomed its three-compartment shaft at its La Sal Mining Co. uranium lease at 573 ft. The firm now is engaged in cutting stations.

Drifting on ore at right angles to a 3200-ft main haulage tunnel is being carried out by Homestake at the Little Beaver Mining Co. uranium lease 3 mi distant in the same Big Indian District. Shipments from this property are expected to commence shortly.

WASHINGTON

Golden Anchor Mining & Milling Co. of Spokane hopes to start production at its gold-silver-lead property near Elliston, Montana, in the spring, using its new type of ore concentrator which is being installed this winter, Henry L. Newmiller, president, reported.

The plant combines the action of a stamp mill and an arrastre, using eight 400-lb wedge-shaped shoes, four of these rotating over four which are stationary. Newmiller reported 12,000 tons ready for milling and between 20,000 and 30,000 blocked out on two levels.

Exploratory work amounting to $13,200 has been done under a DMEA contract of $34,000 but the company has withdrawn from the loan agreement, it is reported.

Talisman Mining & Leasing Co. which formerly operated the Laurier property in northeastern Washington, near the Canadian border, is negotiating for a drilling program on a uranium prospect in the Colorado Plateau uranium area, according to Joseph Skorupski, president. The company has 20 claims in Utah and Colorado and is negotiating for 16 more.

Cornucopia Gold Mines of Spokane ex-

pected to start core drilling for uranium last month at its property in San Juan County, Utah, according to Carl M. Stolle, president.

Plans include building an access road and mining camp.

Ruby Silver Mines Inc. plans to continue exploration and development work through the winter at its Garrett mine east of Nespelem in the northeastern part of the state.

A 50 to 70-ton flotation mill has been installed at the property and an initial shipment of concentrates has been made. Five men are employed. The company took over the 18-claim property on a lease and purchase option from Mrs. Jessie Garrett. J. R. Bartlett is manager and A. G. Henderson, Washington, D. C., is secretary-treasurer.

Chewelah Copper Co. which is developing its properties on Eagle Mountain east of Chewelah, and also some properties there under lease, expected to make its first shipment of ore early in December, E. P. Maher, representative of the company, reported.

Ore will be trucked to a mill, which is under lease with option to buy from Earle Gibbs, at Palmer siding north of Colville. The company has spent 2 yr reopening the United Copper mines near Chewelah. This was one of the large copper producers of the nation from 1900 to 1920. The Chewelah company plans to install a flotation mill at the mine.

Inspiration Lead Co. Inc., of Spokane, reported sending two truckloads of uranium-bearing ore from its 8-claim property in San Juan County, Utah, to an AEC purchasing station at Monticello, Utah, in December.

The ore was discovered soon after starting a tunnel into a hillside. Plans are for tunneling into the Morrison formation, drilling into tunnel walls and also drilling down from the surface.

President of the company is Ernest H. Carlson of Spokane and secretary-treasurer is W. T. Anderson, also of Spokane. Former Idaho State mine inspector, W. H. Simons, is engineer-manager.

It was reported early in December by H. W. Norman, a representative of the AEC, that Midnight Mines, operating on the Spokane Indian Reservation, at Wellpinit, would soon ship its first carload of uranium ore.

Diamond drilling to explore the downward extensions of the mineralized zone is to be done by the U. S. Bureau of Mines for the AEC. A shipping contract has been worked out with the AEC. According to Norman, the mineralized zone is several thousand feet long but it has not been determined to what extent the ore may be commercial.

WYOMING

Mineral production in Wyoming reached a new record high in 1953, the state natural resources board was advised by

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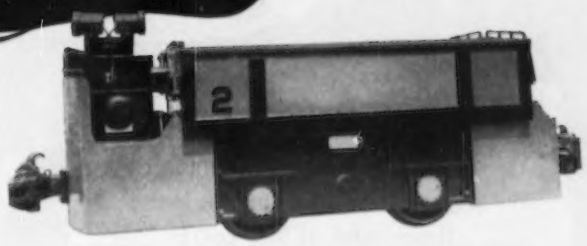

The Greensburg 8 ton Monitor is equipped with two glass insulated motors, contactor type controller and double equalizers. These double equalizers make the difference in performance . . . more tractive effort, better brakes, better riding qualities and longer battery life than any other storage battery locomotive of equal weight and battery capacity!

All Greensburg locomotives are Custom-Built to meet your requirements in both single and double motor drive with drum, cam or contactor type controllers.

For more earning power per invested dollar specify Greensburg Storage Battery Locomotives.

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The Completely NEW More Rugged-Than-Ever 'Jeep'®

MODEL CJ-5

NEW, fully-boxed, front cross-member adds to the carrying strength, rigidity and rugged endurance of the frame.

NEW, sturdier body design with sheet metal flanged and overlapped for extra strength . . . center mounted to relieve road strain and for even greater sturdiness.

NEW, larger windshield has approximately 100 sq. in. of additional glass area and folds on stronger hinges. New streamlined hood offers increased visibility.

NEW, softer front seating is form fitting, bucket design with coil springing and gives a more comfortable ride.

Ask your 'Jeep' dealer for a demonstration.

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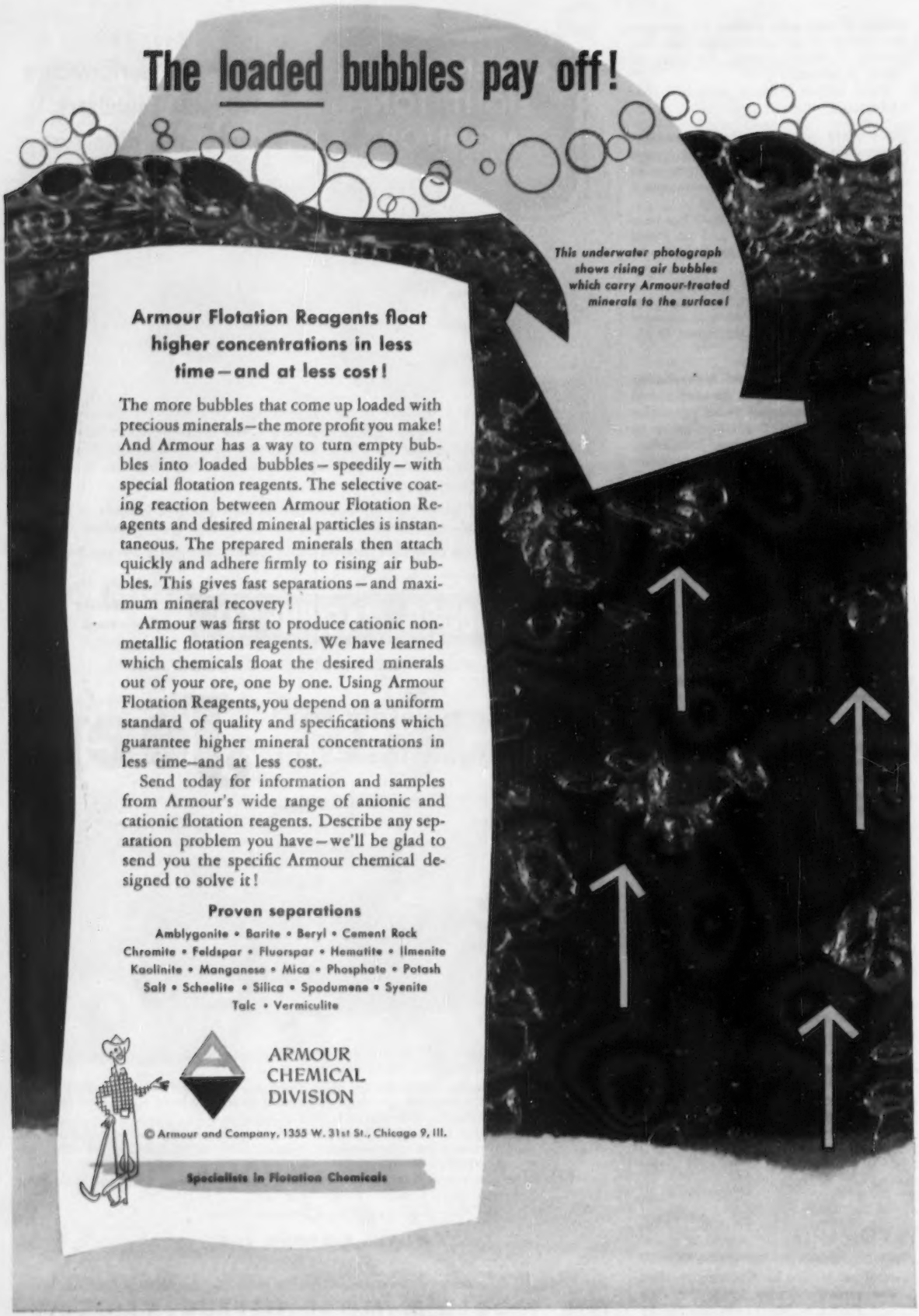
THE WORLD'S MOST USEFUL VEHICLES

The loaded bubbles pay off!



This underwater photograph shows rising air bubbles which carry Armour-treated minerals to the surface!

Armour Flotation Reagents float higher concentrations in less time—and at less cost!

The more bubbles that come up loaded with precious minerals—the more profit you make! And Armour has a way to turn empty bubbles into loaded bubbles—speedily—with special flotation reagents. The selective coating reaction between Armour Flotation Reagents and desired mineral particles is instantaneous. The prepared minerals then attach quickly and adhere firmly to rising air bubbles. This gives fast separations—and maximum mineral recovery!

Armour was first to produce cationic nonmetallic flotation reagents. We have learned which chemicals float the desired minerals out of your ore, one by one. Using Armour Flotation Reagents, you depend on a uniform standard of quality and specifications which guarantee higher mineral concentrations in less time—and at less cost.

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Specialists in Flotation Chemicals

Wyoming *(Continued)*

the U. S. Bureau of Mines.

Total production for the year, including petroleum, was valued at $257,539,000. This represented a gain of about $51-million, or 25%, over 1952.

All principal minerals except coal showed an increase over the 1952 dollar output.

A 33% increase in iron ore production was reported, with the bulk of it from Colorado Fuel and Iron Co.'s Sunrise Mine. Phosphate rock, trona and sulphur zoomed into prominence as Wyoming products.

Possibility of a huge titanium industry in Wyoming was revealed at a conference in Cheyenne between representatives of the U. S. Titanium Corp. and the State Game & Fish Commission.

The Titanium Corp. representatives, including president John M. Murrell of Laramie, Wyo., and Miami, Fla., said a rich titanium deposit has been found near a game refuge west of Laramie in Albany County. They asked withdrawal of the area from the game refuge.

State commission members reportedly agreed to withdrawal, subject to Federal approval.

Murrell said the vein in which his company is interested may contain as much as 1-million tons of ore. Assays have run from 8 to 50%, he added.

A mining operation will be undertaken, Murrell said, if his company is permitted to conduct core tests on the game refuge land and if subsequent tests maintain the high assay of ore already encountered.

A processing plant also is contemplated, the titanium executive said.

IN CANADA

QUEBEC

Eldrich Mines, new gold prospect in the Noranda District, has started shaft sinking with 1,000 ft as depth objective. During the past season headframe and surface plant were installed, and it is expected that production on an ore shipping basis will be reached some time late next year.

Lateral work is being started by Vendome Mines on the 250 and 500-ft levels at its property in the Barraute area, following completion of shaft sinking.

Surface drilling reportedly indicated 750,000 tons averaging 7.25% zinc, 0.35% lead, 0.45% copper, and 2.05 oz silver above the 600-ft horizon. Present program, in addition to crosscutting and drifting, calls for deep drilling from the bottom level to explore the zone to the 1500-ft horizon.

Bulk sampling in preparation for installation of a pilot mill is progressing at the property of Oka Rare Metals Mining Co. near the town of Oka some 20 mi west of Montreal. The property, acquired from Beattie-Duquesne Mines, is a columbium-uranium-thorium prospect.

Production is starting this month at the 6500-ton concentrator of Gaspe Copper Mines, Noranda subsidiary at Murdochville, on the Gaspé Peninsula. Good progress is being made, too, in construction of the smelter, scheduled to go into operation next spring.

The concentrator, setting a record with the largest starting rate in Canadian mining, is expected to reach capacity early in 1955. Initial objective for the two plants is 125 tons of copper daily.

Rainville Mines, copper prospect in the Bourlamaque area, has resumed underground development, following its reorganization under which funds are being supplied by Canadian Malartic Mines.

Primary objective of the new work is the No. 4 zone, indicated by surface drilling but unexplored underground. It will be probed by a 1000-ft crosscut on the 550-ft level.

A three-compartment production shaft is going down on the property of Lyndhurst Mining Co. in Destor and Polaries Twps., 20 mi north of Noranda. It will be

NEW VULCAN-DENVER EXTRA HEAVY DUTY 50 H.P. SLUSHER HOIST

New Vulcan-Denver double drum single shaft 50 h.p. slusher hoist...1 of 13 operating in this western mine. Selection of Vulcan hoists was based on this company's successful experience with Vulcan's 150 h.p. slushers during the past 20 years.

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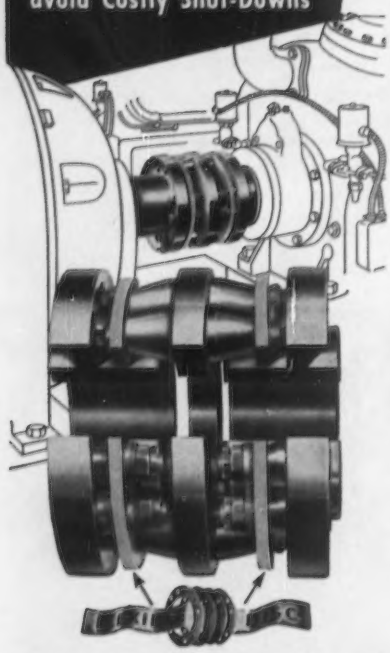
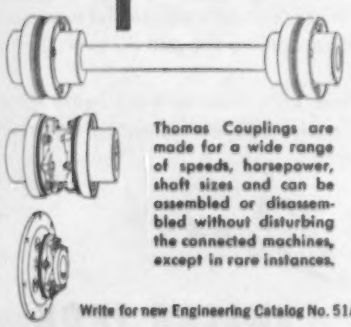
FLEXIBLE COUPLINGS
for Power Transmission to avoid Costly Shut-Downs



Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.

DISTINCTIVE ADVANTAGES

FACTS	EXPLANATION
NO MAINTENANCE	Requires No Attention. Visual Inspection While Operating.
NO LUBRICATION	No Wearing Parts. Freedom from Shut-downs.
NO BACKLASH	No Loose Parts. All Parts Solidly Bolted.
CAN NOT "CREATE" THRUST	Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement.
PERMANENT TORSIONAL CHARACTERISTICS	Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained.



Thomas Couplings are made for a wide range of speeds, horsepower, shaft sizes and can be assembled or disassembled without disturbing the connected machines, except in rare instances.

Write for new Engineering Catalog No. 51A

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U.S.A.

Quebec *(Continued)*

carried to 585 ft, with levels at 175, 300, 425, and 550 ft.

Surface drilling reportedly indicated 382,143 tons of ore averaging 1.95% copper, 8.7% sulphur, and 0.5 oz silver, as well as 165,826 tons of pyrite containing 17.8% sulphur and 0.19% copper, tonnage in each case calculated to a depth of 550 ft.

First lateral work on the three new levels being opened up by Chibougamau Explorers in preparation for production has given good encouragement. Farthest advanced of the three is the 900-ft level, where drifting has disclosed well over 600 ft of ore averaging 0.37 oz gold and 1.08% copper across drift width; flat drilling indicates total width of about 40 ft.

Results on the two levels above were similar: on the 600-ft level the crosscut showed width of 31.1 ft averaging 0.55 oz gold and 0.67% copper; on the 750-ft level 436 ft of drifting averaged 0.36 oz gold and 1.17% copper across drift width.

In the meantime, construction of the company's 500-ton mill is proceeding on schedule, with production expected to start mid-1955.

East Sullivan Mines, big copper-zinc producer in the Val d'Or District, has intersected four new ore structures in a deep vertical drill hole put down below the mine's bottom level at 2850 ft.

Deepest was cut at vertical depth of 3650 ft, a core length of 35 ft averaging 0.93% copper with low gold and silver values.

The others showed 84 ft averaging 1.64% copper, 21 ft averaging 1.39% copper, and 55.5 ft averaging 1.51% copper, all with precious metal values.

One of the best cores pulled to date in extensive depth exploration, the hole is believed to carry significant implications for the mine's future.

ONTARIO

Algom Uranium Mines estimates total indicated-tonnage at its two Blind River area properties at 13,634,500 tons. The Quirke Lake group shows 7,463,500 tons to slope depth of 915 ft with average grade 0.106% U_3O_8.

At the Nordic Lake group reserves are estimated at 6,171,000 tons averaging 0.113% U_3O_8. At Quirke Lake the five-compartment shaft has been completed to 790 ft and levels are being established at 110-ft intervals. At Nordic Lake a shaft of similar size and depth will be put down next year. It is planned to equip each property with a 3,000-ton mill.

Blind River area has become one of Canada's busiest exploration spots of late, with a great many companies active. San Antonio Gold Mines is starting deep drilling on an 80-claim group a short distance east of Algom's Quirke Lake ground, while Roche Long Lac Gold Mines is drilling northwest of San Antonio.

STEEL ERECTION is under way at International Nickel Co.'s $16-million iron ore plant near Copper Cliff, Ontario (see *E&MJ*, October 1953, p 135). Chimney for the new plant soars 637 ft and is the largest in the British Commonwealth. The plant will use an atmospheric pressure ammonia leaching process developed by Inco.

Shaft sinking at the Lake Nipissing property of Beaucage Mines is expected to reach completion at 450 ft by mid-January. The four-compartment opening is being put down on Newman Island, 6 mi from the town of North Bay.

Surface drilling reportedly indicated 5,431,000 tons averaging 0.039% uranium oxide and 0.53% columbium pentoxide in the main zone. To study metallurgical problems a 50-ton pilot plant will be built this winter.

Geco Mines, copper-zinc standout in the Manitouwadge area, reports all work on schedule in its plan to start production with a 3300-ton concentrator by the spring of 1957.

The five-compartment shaft has been collared and is to be sunk to 1500 ft, while a good start has been made on surface plant construction.

An all-weather highway has been built to the property, and both the Canadian National and Canadian Pacific Railways have started branch lines to the camp. A start also has been made on a 75-mi power line right-of-way from Terrace Bay on Lake Superior.

Ontario's newest staking rush developed late in the fall north of Tashota on the transcontinental line of the Canadian National Railway. First company in the area was The Teck-Hughes Gold Mines, which has staked two groups totaling 126 claims. The showing is a copper discovery.

Teck management has been moderate in its statements, but the prospecting fraternity was undiscouraged; staking, with many companies and interests represented, now covers an area several miles wide and some 15 or 20 mi in length.

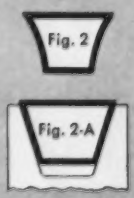
this simple idea cuts V-Belt costs

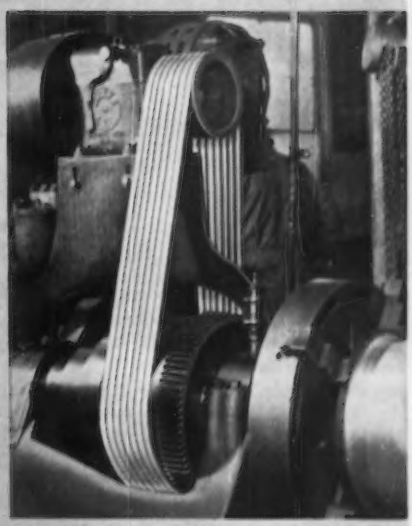
— as a V-Belt bends, feel its sides change shape!

Pick up *any* V-Belt that has straight sides (Fig. 1) and bend it as if it were going around a pulley. At the same time, *grip its sides* with your fingers! You will feel the sides *bulge out* as in Fig. 1-A. Clearly, the bulging belt is forced to press *unevenly* against the V-pulley—and this concentrates wear at the points shown by arrows (Fig. 1-A).

Now bend the belt with CONCAVE SIDES (U.S. PAT. 1813698) . . . the GATES VULCO ROPE (Fig. 2)

Instead of *bulging*, the precisely engineered CONCAVE SIDES merely *fill out* and become perfectly straight. This belt, when bent, *precisely fits* its sheave groove (Fig. 2-A). The sides press *evenly* against the V-pulley. Therefore, wear is distributed *uniformly* across the full width of the Gates Vulco Rope—and this means longer belt life and *lower belt costs* for you!





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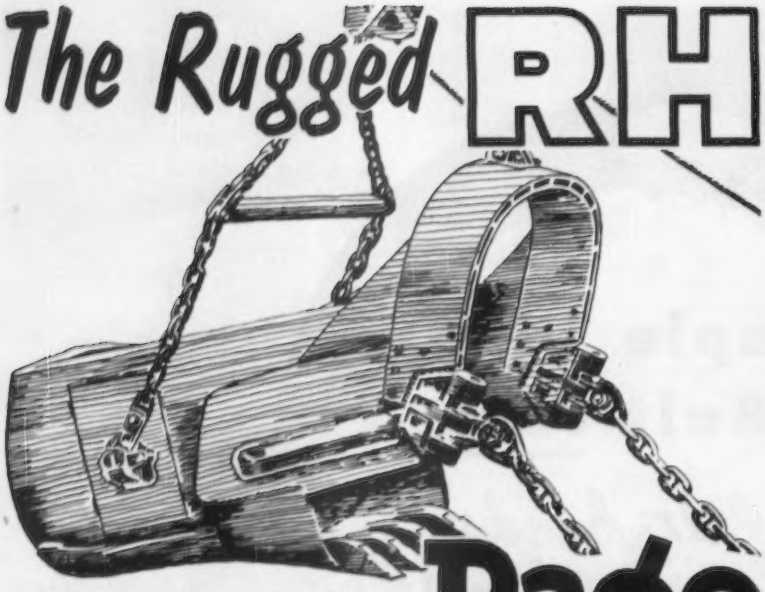

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Page AUTOMATIC DRAGLINE BUCKETS

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in the heart of the jungle

This trailer mounted Acker Teredo Diamond Core drill is hard at work locating and proving chrome ore bodies deep in the heart of a tropical jungle. The operators know from past experience that Acker builds rugged dependability into every drill—yet, essential elements are so light and compact that they can be carried by plane or mule-back.

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Ontario *(Continued)*

Diamond drilling is planned by Teck, the work to start this month.

NEWFOUNDLAND

Installation of a concentrator is planned by Dominion Wabana Ore Ltd., iron ore producer on Bell Island. The plant will be built this winter. Production will be cut back during the three-month construction period.

N. W. TERRITORIES

Reports of development of vast lead-zinc deposits more than 500 mi north of Edmonton indicate these may become among the largest base metals operation in Canada, according to a report by G. H. Finland, secretary-manager of the Alberta and Northwest Chamber of Mines.

Recent reports of the mine operations visualize a daily production of 10,000 tons of ore compared with the initial estimate of 2,000 tons.

The deposits are at Pine Point on the south shore of Great Slave Lake, accessible by road via Mackenzie Highway or by railway and river boat service to the north.

A shaft is being sunk by Pine Point Mines, a subsidiary of Consolidated Mining & Smelting Corp., in turn owned by Canadian Pacific Railway. The shaft was last reported at 85 ft and running through a 50% combined lead-zinc body.

The mining company, holding 1,000 claims, has spent more than $3-million so far on development work. It is believed 5-million tons can be mined by open pit methods, Finland said.

Construction of a 540-mi railroad link, estimated to cost $50-million, is an important requirement for large scale development of the mining field, Finland says.

Mining men claim a start on mining operations could be made by trucking ore concentrate to the existing railbed in northern Alberta via the Mackenzie Highway. This would require construction of a 90-mi road to the mine site.

BRITISH COLOMBIA

A Vancouver Island mine, discovered about 40 yr ago, has sprung back to life as a profitable copper producer.

In announcing expansion plans, Ossie G. MacDonald, president of Cowichan Copper Co. Ltd., disclosed he has had offers from three major companies to take over the property near Cowichan Lake.

Recently the mine has been shipping ore to smelter at Tacoma twice monthly. Last month the ore netted $50,000 and averaged better than 8% copper, MacDonald said.

Discovered in 1915, the property lay

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heavy duty portable cords and cables

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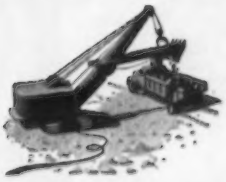

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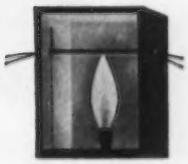
resistance to kinking



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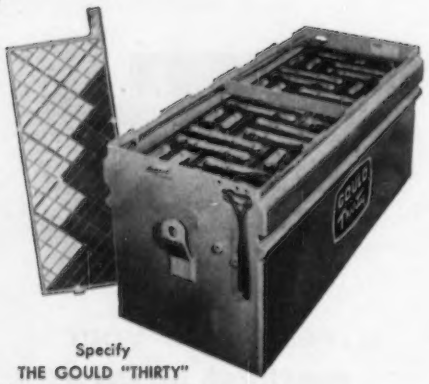

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British Colombia *(Continued)*

almost idle until 1928, when British Metals subsidiary, Pacific Tidewater, took it over.

MacDonald acquired three crown-granted claims at the property and the base metal rights from B. C. Forest Products about two years ago.

Denial that Granby Consolidated Mine at Copper Mountain "is finished" as a copper mine came this month from president L. T. Postle. His statement came on the heels of announcements from officials of International Mine, Mill & Smelter Workers that they had been told by company spokesmen the mine could not guarantee continued operation after March of next year.

Union and company are in disagreement over wages. Union refused company's wage offer on basis of last year's agreement and decided to press for 3% across-the-board wage increase plus guaranteed pay for Christmas and New Year's Day.

"We're not going to close down as long as we can possibly keep going," Postle said, declaring there was sufficient ore to continue operating at present prices until end of 1955 at least.

Cassiar Consolidated Mines Ltd. hopes to prove up enough gold, silver, lead and zinc ore from its workings at Portal Mining Co. claims in northwestern British Columbia to warrant a 150-ton mill.

Development work is progressing favorably, a report from Cassiar management states, and up to end of October, 2140 ft of track had been laid in main haulage tunnel at 250-ft level.

IN LATIN AMERICA

MEXICO

In a summary of the fluorspar situation in a recent issue of the Asarco News Letter, Peter E. Caron observes that importations of acid grade have increased, partially as a result of the construction of drying plants in Wilmington, Del., to handle the wet cake landed there, but mainly because of the entry of Mexico as a major shipper.

Spain and Newfoundland had been the main sources of imported spar until 1952, when Mexico's potential was first realized.

"Owing to oversupply, today's price for acid grade fluorspar is depressed as compared to peak prices during World War II and the Korean conflict, when it sold for $65 a ton, f.o.b. domestic mine. Domestic fluorspar is now offered at $47.50 to $53. Imported material has been sold at port of entry at prices as low as $30 a ton, duty paid, for acid grade gravel, a hand-picked and jigged product which must be ground prior to use," Caron states.

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- Accurate . . . within ± ½ of 1% of actual weight from maximum to 50% of meter's rated capacity; within 1% from 50% to 25% rate; within 2% from 25% to 10% of rated capacity.
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- Responds accurately to rapid load variations.
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Write for Bulletin 550-H4. Builders-Providence, Inc. (Division of B-I-F Industries, Inc.), 391 Harris Avenue, Providence 1, Rhode Island.

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Mexico *(Continued)*

"The American Smelting & Refining Co. decided to enter the fluorspar picture in Mexico in 1953," the author points out, adding: "Ore reserves were acquired and a mill and flotation plant constructed at Agujita, 10 mi from Asarco's operations in Rosita.

Crushing plant at Agujita

"The Encantada Plant, as it is known, owned by Cia. Minera Nacional, S. A., and rated at 2,200 tons of acid grade concentrate a month, was completed in June 1953, and shipments began in July. Rather than undertake actual mining of fluorspar, the company decided to purchase the mill feed requirements from scores of small local producers.

"In May of this year the company's fluorspar operations were expanded by entry into the market of an exceptionally high quality metallurgical grade material. This ore, which originates in the Paila district, is stockpiled at Castanos and is screened and shipped in boxcars or open gondolas either directly all-rail through Eagle Pass, Tex., or to the port of Brownsville, Tex., where it is accumulated and sent up the Mississippi in barge lots to Chicago and Pittsburgh.

"Asarco's entry into fluorspar production was based on a conviction that, in the near future, U. S. requirements for fluorspar will materially increase. The requirements of the acid industry alone could easily double in a few years."

Republic Steel Corp. brought a special planeload of newspapermen and mining experts to Mexico last month to view their new rutile development.

The rutile field is located near the Pacific Coast of Mexico in the southern part of the country, southwest of Oaxaca.

Republic has given no details over its plans, but it has been public knowledge that it has been studying the area for considerable time and has an operating concession there.

Mexican press has continued to deplore the difficult situation of the Mexican mining industry and to call on the government for reforms which will enable the industry to recover its former industrial preeminence and to progress rather than to decline.

A prominent engineer, Maximino Muñoz, writing for publication, notes that the Mexican mining industry produces an annual gross income between 2,000-million and 3,000-million pesos (roughly $200-million), while the state derives tax revenue each year of somewhere between 600-million to 900-million pesos (about $50-million to $75-million). But he notes that the government has given little back to this industry which has served the country so much.

CHILE

President of the Republic inaugurated the new flotation-cyanidation mill built by the Mining Bank in the town of Illapel in the southern part of the Province of Coquimbo.

This mill has a capacity of 3,000 tons of ore per month: 1,500 tons of gold ores by cyanidation; 1,500 tons of ore per month by flotation whether these be copper or lead ores. The three classes of ores occur in the zone that will be served by this mill.

Braden Copper Co. achieved another record by working 68 successive days and 360,500 man-hours without an accident causing loss of time.

Administration has upped the banking rate of exchange from 110 pesos to 200 pesos to the dollar. The fact that the U. S. dollar was pegged at 110 pesos while other European soft currencies, such as the German, were fixed at a much higher rate was causing Chilean mining and other exports to go to European countries such as Western Germany and Great Britain and producing a scarcity of U. S. dollars and needed U. S. imports such as machinery and spare parts.

The "free" or black market rate of exchange on the U. S. dollar is now about 290 pesos to the dollar.

VENEZUELA

During 1955 vast sulphur deposits in the State of Sucre, 32 km from the port of Carúpano, in the El Pilar region, will be developed by the Venezuela Sulphur Corporation of America, it was reported in Caracas.

It is hoped commercial production of sulphur will commence by October 1955. A refinery reportedly will be installed, which during the first year of operation will produce 75,000 tons of clean sulphur, and later on production will be increased to 100,000 tons annually.

The company which proposes to develop the sulphur mines has been granted a concession for 50 yr, renewable for an equal period, and more than $3-million reportedly will be invested.

COSTA RICA

Bonanza Gold Mine, near the Pacific port of Punta Arenas, was reopened last month. This mine has been in existence since 1850 but operations were shut down during World War II. It is said to be Costa Rica's only mine operating now, although gold mining at one time was said to be a major industry in this Central American nation.

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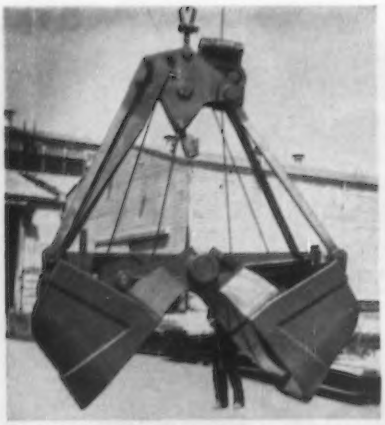

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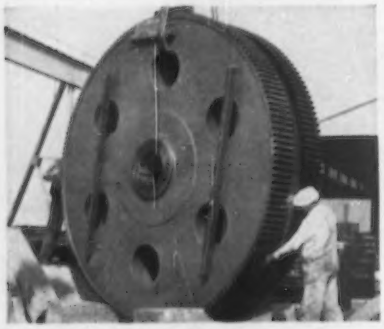

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Costa Rica *(Continued)*

Bonanza has been owned since 1946 by Alfred C. Bean, veteran mining engineer, through the Miramar Mining & Exploration Co.

Bean said that dewatering of the mine at its lowest level has been completed. Former owners reportedly flooded it after it was shut down.

Surveys after dewatering disclosed the vein intact with occasional high value pockets, Bean stated. More probing will be necessary to establish the extent of the vein before any plans for a mill are made, he added. The reopening was backed entirely by Costa Rican capital, it was reported.

IN AFRICA

Two more South African gold mines have been scheduled as uranium producers. Vaal Reefs, in the Western Transvaal is to erect a plant to treat 65,000 tons of gold residues a month. It will be completed in 1956 and capable of full production by the end of that year.

Merriespruit G. M. in the Orange Free State is to recover uranium and pyrite concentrates which will be delivered by pipeline to the neighboring Virginia G. M. uranium and pyrite plant. Both the Virginia plants will be expanded to deal with this. Pumping will start towards the end of 1955.

The Virginia uranium plant will start up in the mid-1955 and the pyrite plant early in 1956, treating materials derived from the Virginia mine.

This latter scheme introduces a new development in uranium and pyrite recovery in this country. Both materials will be concentrated by flotation before pumping to the recovery plant. Up until now the slimes have been pumped straight from the gold reduction works.

Bancroft Copper Mine in Northern Rhodesia is expected to start production early in 1957 instead of in 1958 as was originally forecast. Full production will be about 150,000 short tons of ore a month. Proved ore reserves are now estimated at 92-million short tons of 3.67% copper, against preliminary figures of 79.6-million tons and 3.6%. Drilling operations have proved the existence of cobalt in the orebodies, the highest value being .49%.

Considerable economies in reduction costs are anticipated at Doornfontein and West Driefontein gold mines through the adoption of mechanical reef sorting.

This is based on the Basal Reef, which is the rich gold and uranium carrier being of a friable nature. Run-of-mine ore is passed over a plus or minus 2-in. screen. The bulk of the reef being under this size passes through and is introduced into the mill circuit at a suitable stage. The balance is passed over a conveyor belt and "reef picked"—in contrast to the usual practice of waste sorting.

It is estimated that this will reduce the tonnage reaching the mill by about 30% elimination of unpay material. In the case of West Driefontein, where waste sorting is practiced, the gain will be 18%. At Doornfontein, the full 30% will be achieved. At Doornfontein present capacity of the mill is 50,000 tons. The mechanical sorting will mean that the amount of gold and uranium recovered will be the equivalent of 74,000 tons of current grade of ore a month or equal to the installation of a third reduction unit.

Investigations are being made into methods of reef sorting the Vaal and Basal Reefs. These also are rich and narrow, but are not so friable. One possible line of approach being considered in an electronic process depending on the intimate association of gold and uranium in the actual reef bands and the absence of radioactivity in unpayable formations.

A radical departure from standard mining practice is being made at Harmony G. M. on the new Free State gold fields by planning the removal of shaft pillars as the initial step in mining rather than leaving this intricate operation until the closing years of the life of the mine.

The underlying theory is, firstly, that the operation is simplified in many respects by mining pillars before abnormal and heavy stresses have been set up in it by mining operations in the surrounding areas and, in addition, any settlement in the shaft should be gradual. Secondly, the immediate removal of the shaft pillar enables stoping to begin earlier as this can be undertaken in the immediate vicinity of the shaft instead of waiting until enough development work has been undertaken to enable stopes to be opened up further afield.

Sales of minerals, other than diamonds, gold and uranium, by South African producers are likely to top $140-million this year.

For the first nine months they realized approximately $90-million, $3-million more than for the comparable period of 1953.

Biggest increase over 1953 figures is contained in the "other materials" figure of more than $19-million, a rise of $3.75-million. This item includes platinum and antimony sales. Copper sales rose by $1.2-million to $18-million and asbestos by $1-million to $10-million.

The biggest shortfalls—due to rail transport shortages—were in manganese, down $1.75-million to $6.6-million and chrome—$1.18-million to $4.1-million, it was reported.

Rhodesian Selection Trust Co., owners of two of the major mines on the Northern Rhodesian Copperbelt has given six months notice to the Northern Rhodesian European Mineworkers Union that the agreement between the company and the Union will be terminated on May 4, 1955.

This was being done in order to clear the way for the advancement of Africans in the copper mining industry in Northern Rhodesia in conformity with recommendations of the Forster Commission which recently examined this question. The Union has been invited to open negotiations for a new agreement.

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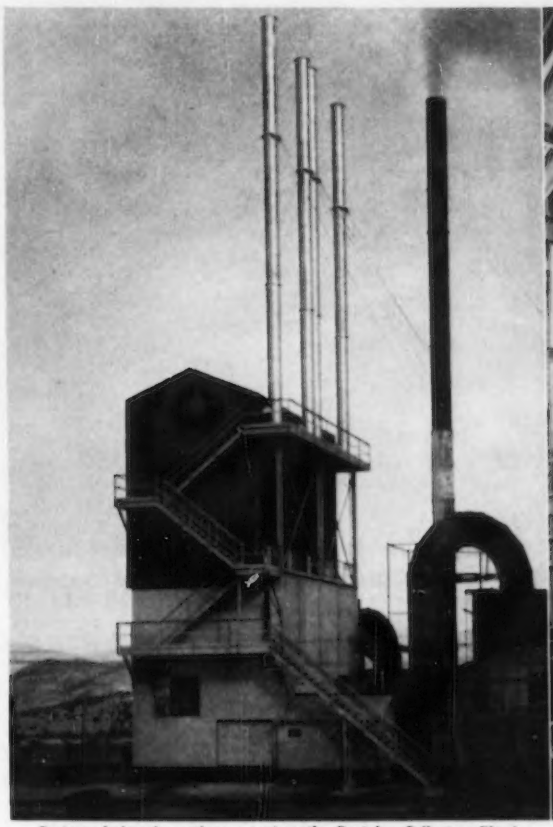
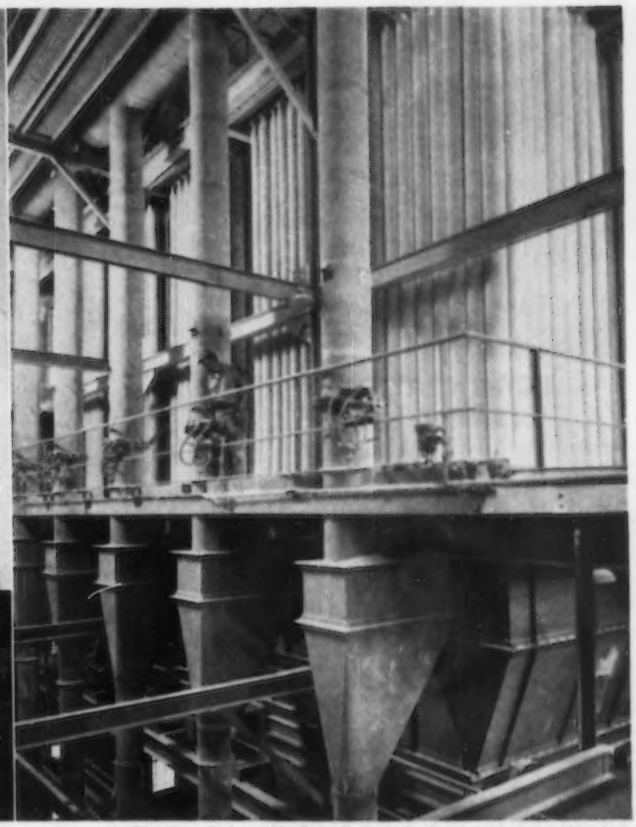


Custom designed continuous automatic Dustube Collector filtering 25,000 c.f.m. gases from a Dwight-Lloyd sintering machine at The New Jersey Zinc Co., Empire Zinc Div., Canon City, Colorado.



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WEST DRIEFONTEIN G. M. REDUCTION PLANT as seen through the top of the headframe. This mine is one of the new producers on the Far West Rand and is South Africa's richest gold mine thus far. More than 38,000 oz of gold per month are recovered from about 52,000 tons of ore milled. Grade is more than 15 dwt against the average for the Witwatersrand of 3.988 dwt. Monthly working profits of West Driefontein are said to run about $870,000. This grade will be stepped up when the reef-sorting technique comes into full operation. A uranium extraction plant, now being erected, is expected to begin operation in about 18 months.

Rhokana Corp. Ltd., Northern Rhodesia, in a report which covered the 1953-1954 year ended June 30, said 4,138,500 tons of ore were milled from the Nkana and Mindola Mines. Grade listed was 2.59% copper and 0.154% cobalt which made up 273,724 tons of concentrates. This yielded 79,755 tons of copper, blister and electrolytic.

In addition, the Rhokana report released information on the following mines, in which it has interests:

Bancroft Mines Ltd. (47.7% interest), is expected to begin production early in 1957. Later that year it is expected to attain full production at the rate of some 43,000 long tons of copper a year.

Mufulira Copper Mines Ltd. (26.59% interest), in the year ending June 30, produced 87,972 long tons of copper compared with 76,089 long tons for the previous year.

Chibuluma Mines Ltd. is scheduled to begin production near the end of 1955. Production plans call for annual output of 16,000 long tons of copper and 500,000 lb of cobalt. Chibuluma reserves were set at 7.3-million short tons of ore, averaging 5.23% copper and 0.25% cobalt.

Baluba Mines Ltd. and Chambishi Mines Ltd. (26.59% interest) are not slated for development in the near future. Baluba orebody is estimated to contain 70-million short tons of ore averaging 2.68% copper and 0.18% cobalt. Chambishi orebody is said to contain 25-million tons of ore averaging 3.46% copper.

Vaal Reefs Exploration & Mining Co. Ltd. has announced that it has been formally approved as an uranium producer.

By arrangement with the South African Atomic Energy Board, it will now erect a plant with a treatment capacity of 60,000 tons per month for the extraction of uranium from the residue slimes of its gold reduction plant, it was reported in London.

The uranium plant is expected to be completed during 1956 and to be ready for full production by the end of that year. Contract with the board for the sale of uranium is expected to be from the date production starts to the end of 1965.

Company announced also that the South African Mines Minister had approved the grant of a mining lease over an area of about 6,918 claims comprising portions of the farms Vaalkop No. 110 and Modderfontein No. 45, district Klerksdorp, under conditions set out in the Directors report.

IN AUSTRALIA

"Important discovery" of a previously unsuspected connection between uranium occurrences and certain surface rock types may prove a boon to uranium prospectors, according to Senator Spooner, Minister for National Development. He said discovery had been made by M. A. Condon, acting chief of the Bureau of Mineral Resources, in the Katherine-Darwin area, Northern Territory.

Condon found that a significant num-

HERE'S REAL MATERIAL HANDLING NEWS

New STEARNS 2-coil magnetic pulley removes more tramp iron than larger units on many conveyor operations—yours may be one

Stearns now offers a powerful new electromagnetic pulley that provides exceptional tramp iron removal *throughout the entire load mass.* Two-coil design produces a magnetic field that is deepest at the center of the conveyor belt where load is heaviest. The area of magnetic attraction is the same general shape as the load on a conveyor operating under standard conveyor practices.

Pulley costs less

Because of the nature of the magnetic field, smaller pulleys costing less, can now be used on jobs where larger units were formerly needed. An examination of data on a number of proposed installations showed that, in the majority of the cases, the recommended new 2-coil pulley is of smaller diameter than a 3-coil pulley handling the same job.

Get all the facts on this new magnetic pulley. Find out how it simplifies pulley selection. Write for bulletin 303-C.

SIMPLIFIED PULLEY SELECTION METHOD*

Because this pulley fits right into recommended conveyor standards for speed of belt travel and depth of load for various types of materials, it is far simpler to select the right pulley than ever before. Stearns provides new selection tables in Bulletin 303-C that now make it possible for you to select the right size unit for your job even before you consult our sales engineers.

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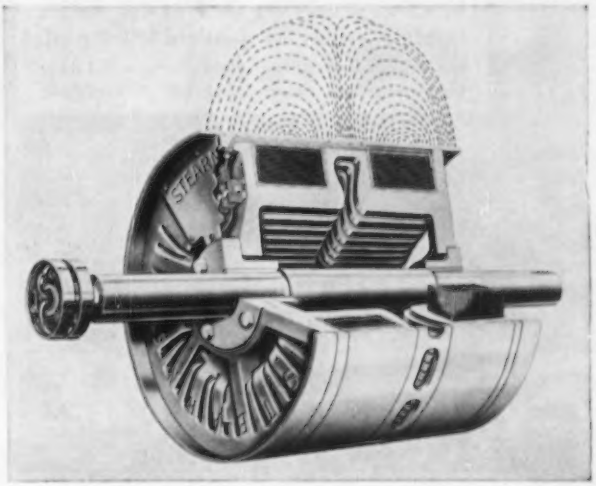

Cutaway showing 2-coil construction. This design provides a deeper magnet field at the center of the pulley — a pattern which conforms to normal load conditions.

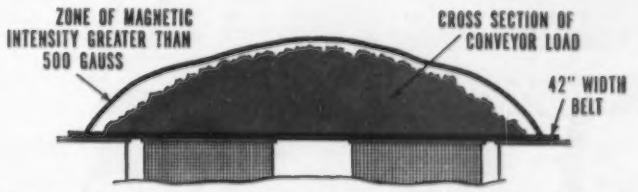

Diagram showing magnetic field for 2-coil, 36-in. dia., 42-in. wide pulley. Note how magnetic field blankets entire load.

Diagram of same size 3-coil pulley. Note how center of load extends above magnetic field. Conveyor would require a larger pulley operating at slower speed in order to do an effective tramp iron removal job.

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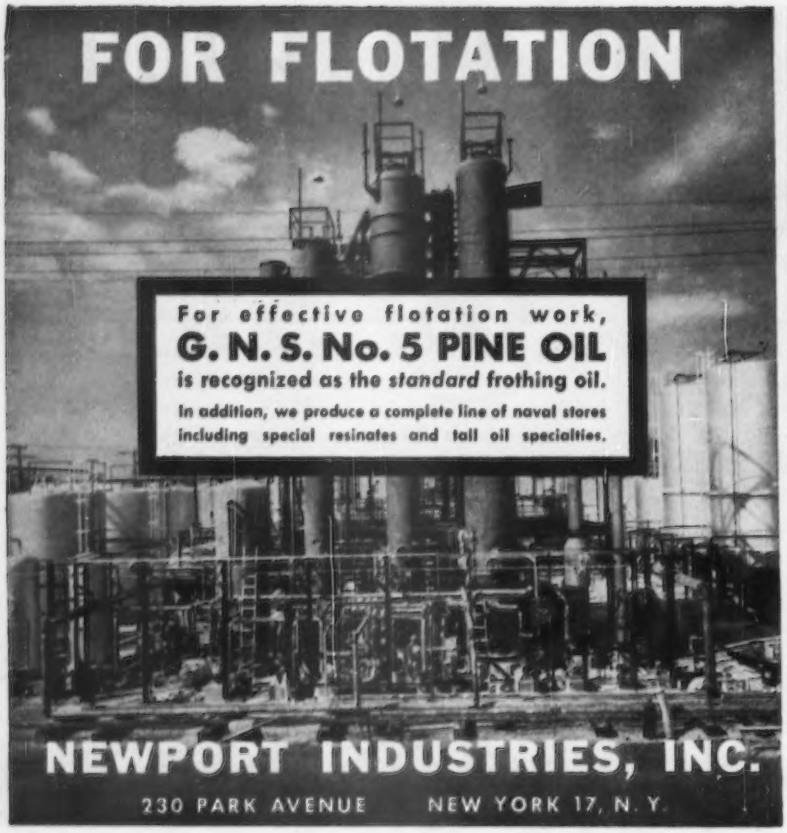
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Australia *(Continued)*

ber of mines and prospects, including Rum Jungle, Sleisbeck, Koolpin Creek, Coronation Hill Reserve and Coirwong Creek, were mineralized in the vicinity of quartz-hematite-breccia ridges. He said that the uranium-bearing rocks were usually covered with rubble from the ridges and could therefore be found only with counters where the rubble was thin or missing and advised prospectors to investigate any high geiger count in rubble-covered areas along quartz-hematite-breccia ridges, at least to the point of removing the rubble.

The scientific basis and significance of the discovery have been described in a technical paper to be published by the Bureau of Mineral Resources, Canberra, A.C.T.

Australian tin producing industry did not warrant any financial assistance by way of bounty or support prices, the Commonwealth Tariff Board stated in a report submitted to Parliament. The board's finding is that price stability sought by the industry would cost taxpayers £A500,000 a year, but the increased production induced by stable prices would not justify such an expenditure.

Another report tabled in Parliament is concerned with assistance to copper. It winds up with the conclusion that there is no need for the imposition of protective customs duties or for the expenditure of public funds in the form of bounty payments so long as producers of basic copper can obtain a price of £A250 per ton. The board recommends duty-free admission of unrefined copper from all sources. The proposed duty on refined copper is £A4 per ton.

NORTHERN TERRITORY

Published calculations of mining and transport costs for uranium ores have tended to present an unreal picture of prospects, warns *Australian Mineral Industry* published by the Bureau of Mineral Resources. They generally ignore two important points, the bulletin stresses: the Atomic Energy Commission will not take more than 20,000 tons of ore a year from any one source at published prices. And, until other plants are erected, the ore must be readily amenable to treatment at Rum Jungle. If a company is not prepared to erect its own treatment plant but has ore suitable for treatment at Rum Jungle, its profit-making potential must be calculated on a mining rate of not more than 20,000 tons of ore annually, and it is further limited by the cost of transport to Rum Jungle.

Uranium Development & Prospecting N. L. is continuing to develop its Adelaide River property. The deposit has now been tested to a depth of over 100 ft and over a length of some hundreds of feet. The lower workings are in primary ore. According to company reports, ore containing between 0.5% and 1.55% U_3O_8 has been trucked to Rum Jungle since

August. Brocks Creek Uranium N. L., too, has sent parcels of ore to Rum Jungle. The Brocks Creek area is being tested by underground working and diamond drilling to determine whether there is an orebody with economic possibilities. Diamond drilling has failed to reveal continuation in depth of the very favorable surface mineralization in the Sleisbeck area worked by North Australian Uranium Corporation N. L.

South Alligator River fault zone is currently enjoying the spotlight as Australia's latest uranium hunting ground. Fabulously rich outcrops have been reported from the area. A sample from a Uranium Development & Prospecting N. L. find has reportedly been described by the former Director of Mines in the Territory (but now a superintendent with Uranium Development) as the richest he has ever seen.

WESTERN AUSTRALIA

Mining of spodumene has begun at Ravensthorpe and an initial shipment of four tons has been made to Europe. This is reportedly the first production of lithium minerals in Australia since 1949. The spodumene occurs as crystals up to 2 ft long and 6 in. wide in a pegmatite exposed in a stream bed. Reserves up to a depth of 10 ft are estimated to contain over 3,000 tons of spodumene assaying 6.2% Li_2O.

Output of manganese ore of all grades in the first half of 1954 was 9,540 tons. Production has been stimulated by contracts with the Rum Jungle uranium treatment plant and by last year's relaxation of the embargo on exports. The two producing areas are Horseshoe, 90 mi north of Meekatharra, and Gregory Range, 200 mi east of Marble Bar. Western Australia is potentially a considerable source of manganese.

Output of tantalite-columbite concentrates during the first half of 1954 by all companies totaled 78,202 lb containing about 50% combined pentoxides. Northern Mineral Syndicate and Perron Bros. are operating on the Turner river 20 mi southeast of Wodgina. Alluvial gravel is treated on Humphrey spirals and jigs to give a columbite concentrate containing 65% combined pentoxides. Production at each plant is expected to be about 100 tons of concentrates a year. On completion of its plant at Wodgina, Northwest Tantalite N. L. expects to be in production by the turn of the year. The company plans to treat 540 tons of ore weekly for a concentrate containing 65% Ta_2O_5. Later, Northwest intends to treat the columbite deposits at Mt. Francisco and Stannum.

Output of refined tin for the first eight months of 1954—1,372 tons—was the best result in many years. The Pilbara district is likely to become one of Australia's most important tin-producing areas by 1956, the Bureau of Mineral Resources predicts. Besides Shaw River Alluvials N. L., two companies are expected to be in production shortly.

SOUTH AUSTRALIA

Opening the £A5-million Radium Hill uranium mine, the State premier, Mr. Playford, spoke optimistically about the prospects of the uranium bearing area at Crocker's Well, 70 mi north of Radium Hill. Sir Lyell McEwin, S. A. Minister for Mines, said that Radium Hill ore is one of the most difficult ores in the world to treat. It is also difficult to get. The winder plant has been designed to cope with a main shaft 2000 ft deep.

Gold & Mineral Exploration N. L., an Adelaide company, reports a nickel find in the northeast corner of the state.

TASMANIA

Australian output of tungsten concentrates (845 tons, 65% WO_3) during the first six months of 1954 was much the same as in the corresponding 1953 period. Of the three main producers, King Island Scheelite (1947) Ltd. and Aberfoyle Tin N. L. have increased their ore treatment rates continuously over the last eighteen months. King Island now treats about 20,000 tons of ore per month and Aberfoyle about 5,000 tons per month. These two mines now account for three quarters of Australian tungsten output.

VICTORIA

Central Deborah Gold Mining Co., N. L., and North Deborah Mining Co., N. L., the last two gold mines operating on the historical Bendigo field, suspended mining operations in November. But, after being idle for the last two years, Ballarat South Goldfields N.L. has resumed work.

NEW SOUTH WALES

North Broken Hill Ltd.'s operations in the year ended June 30 resulted in a net profit of £A1,768,087. Mine's construction program was about 75% complete on June 30. £A800,000 will be spent over a further period of three to four years, mostly on the sinking and equipping of the No. 3 shaft.

QUEENSLAND

Record production of copper is reported by Mount Isa Mines Ltd. for the year ended June 30. The output of 20,407 tons was 539 tons higher than the previous record. It was obtained from 1,210,980 tons of ore. This ore also yielded 3,090,936 oz. of silver, 37,926 tons of lead and 20,513 tons of zinc. Operating costs per dry ton of ore treated dropped to 85.1 s, from 90.6 s in the preceding twelve-month period. Estimated reserves of copper ore were 3,700,000 tons and of silver-lead ore, 9,900,000 tons.

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Cross section at left shows how KLEENSLOT Screens operate on a non-clogging principle.

Wedge Wire KLEENSLOT screen guards can be furnished in special sizes to your requirements in practically any type of long wearing metal. They are made to close tolerances like all Wedge Wire products—the width of each wire is held to plus or minus .002 to insure uniform opening width. All Wedge Wire features are embodied in these screen guards and it is to your advantage to consider them from the standpoint that they are non-clogging, non-blinding, strong, rigid uniform and more economical in the long run.

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GAS ST. AT NICKEL PLATE R.R.
WELLINGTON, OHIO

two-way side dumping eliminates truck tie-ups ... keeps rock production high

Assurance of constant, smooth flow of rock from quarry to crusher and elimination of costly truck delays have been achieved by Buffalo Crushed Stone Co. of Bowmansville, N. Y. through a flexible system of two-way side dumping at the crusher.

The greater flexibility of this system was achieved by converting from single truck units to truck-trailer combinations—thus doubling payload capacity for stepped-up production. Since all the dump bodies are designed for two-way dumping, the trucks can roll in on either side of the crusher. Remote-control overhead dumping system enables one man to control the feeding rate and the crusher operation. Feed is uniform...truck delay is eliminated.

Each of the six trucks hauls 28 tons in two side-dump bodies; 14 tons on the truck and 14 on the trailer. They handle grades up to 10% and roll at speeds up to 27 m.p.h. on the level. Each truck makes 22 trips daily between the quarry and the crusher, hauling a total of 3700 tons and using only 1.2 gallons of diesel fuel per hour per truck.

In switching to tandem operation, Buffalo Crushed Stone Co. knew they had a job calling for trucks that "have what it takes." Result: They bought Macks—six Model B-61 six-wheelers powered by Mack Thermodyne® Diesels, and equipped with heavy-duty Mack transmissions to meet stiff grade requirements.

On your job, too, Mack trucks can make the big difference by hauling more—for less.

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wise old owl says..

Canton Truck Cleaner for all types of mines, iron, copper, hard and soft coal . . . potash . . . salt. Savings are spectacular . . . pays for itself in few months. We'll put one in your mine . . . pay us out of savings.

Other Self-liquidating Equipment, Rock Dusters, Electric Switch Throws, Car Transfers, Automatic Doors, Cable Splicers.

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ROWEN WINDBOX SEAL

Increases Production, Lowers Costs, Improves Product Uniformity

Increased sinter production, lowered costs and a more uniform product result with the use of the Rowen windbox seal* on the new Dwight-Lloyd machine. The seal completely eliminates air leakage between pallets and windbox, with these results:

a more uniform product – sinter at edge of pallet gets same amount of air as sinter in the center.
greater production – more efficient burning permits faster operation.
lower operating costs – less air is needed to do the job.

The Rowen windbox seal is the result of intensive research by our engineers. It is another major Dwight-Lloyd contribution that has maintained sintering as a modern, economical process.

Among the other exclusive features of the new Dwight-Lloyd machines are: *Upper windbox* – for updraft or downdraft operation. *Compound discharge curve** – eliminates spillage, controls pallet drop, cuts pallet wear. *Roll feeders* – assure an even distribution of charge on pallets.

Write for detailed information.

*PATENTED

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DIVISION OF SINTERING MACHINERY CORPORATION
120 SINTER AVENUE • NETCONG, NEW JERSEY

Drill Sharpener Model IR-40
with Model 455P Punch

Designed for bits up to 3" gauge on any standard section up to 1½" size. For shanks of any type for hammer or piston drills on all steel up to 1½" size. Capacity: forming new bits, 30 to 60 per hour; resharpening bits, 60 to 100 per hour; making standard shanks, 25 to 50 per hour. Requires 75 to 100 PSI air pressure for most efficient work. Over $700 worth of spare parts. In new condition. Packed for Export Shipping.

Total weight: 4,500 lbs. F.O.B. Fort Worth, Texas New York

Cost government over $4,700 **NOW $795**

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see your B-G distributor or write
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NEW MINERAL ASSAY LABORATORY at Taejon, Korea, is helping rebuild the Korean economy on a sound basis. The laboratory was built and equipped for $160,000 by the United Nations Korean Rehabilitation Administration. Lt. Gen. John B. Coulter, UNKRA agent general, and Korean President Syngman Rhee spoke at formal opening ceremonies last March. Laboratory is the large building with smokestack. Surrounding structures house Korean metallurgy students and international experts who have been training Koreans in operating the laboratory.

IN SCANDINAVIA

NORWAY

Contracts for the export of iron ore to Britain and West Germany in 1955 have been concluded by the Norwegian iron ore mining firm A/S Sydvaranger, in Kirkenes, North Norway.

The contracts cover a total quantity of 700,000 tons to be shipped to the two countries next year. This is about 80% of the firm's whole annual production, and the exports to these two countries will thus be about the same as in 1954.

Norwegian iron ore mines A/S Sydvaranger, in Kirkenes, northern Norway, have produced 1.8-million tons of iron ore since April 1952 when production was resumed after the post-war reconstruction.

Demand for this material is expected to exceed the firm's production in a couple of years. In 1955, about 500,000 tons are expected to be delivered to West Germany, 200,000 tons to Britain and about 60,000 tons to the Norwegian iron works.

Narvik handled 650,000 tons of Swedish iron ore in November—about 10,000 tons more than in October. Total ore shipments through Narvik in 1954 amounted to 7.8-million tons by November.

FINLAND

Otanmaeki iron mine in northern Finland expects to produce 250,000 tons of concentrates in 1955.

Large-scale production began last year when Otanmaeki exported some 175,000 tons of magnetite. A note added that ilmenite also has been exported. The company said in an unofficial report that its entire 1955 ilmenite output already has been sold.

IN THE PHILIPPINES

Occurrence of uranium in Philippine ores has been reported by Philippine Iron Mines, largest iron ore producer in this country. Uranium ore of commercial value reportedly has been found on a PIM placer claim in Camarines Norte in southern Luzon near Larap where the principal iron mines are located.

Samples of this uranium ore were flown to the U. S. Bureau of Mines station at Tucson for analysis. It was reported that the analysis disclosed uranium content considered commercial.

Mindanao Mother Lode reportedly has proved up copper ore in a large vein just east of Km 196 in Zambales. Extent is being determined by drilling.

Yawata Iron Co., the Fuji Iron Co., and the Nippon Steel Tube Co., Japan's biggest iron manufacturers, reportedly have agreed to make a joint loan to the Philippine Iron Mining Co. at Larap for mining apparatus improvements.

Purpose of the loan is the establishment of friendly co-operation between suppliers and consumers, according to a spokesman of the joint committee of the three Japanese firms. Details will be negotiated later.

Rough plans at present envisage a total expenditure of about $2-million. The Japanese firms will supply the funds required for machinery and apparatus, but they will not cover building expenses, it was added.

Repayment of the loan will be effected by deliveries of ore to the Japanese firms over a period of 5 yrs. The Philippine Iron Mining Co. is quoting an average price of about $7.63 per ton fob for 58% ore, but the Japanese firms are hoping to obtain lower prices, it was learned.

Bessemer

operation proves that Hazacords can take punishment

All the units in this operation are "big bruisers" selected for ability to operate on a big scale under the most difficult conditions. At this Bessemer Limestone and Cement Company limestone quarry the five-cubic-yard dippers can load at the rate of 400 tons per hour. The blasting, rock dust and rough ground mean that only top quality materials can keep all operating equipment from trucks to electrical cables continually on the job.

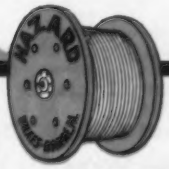
Operating at 4160 volts, the Hazacord Type SH-C, 5-kv portable cables have proved themselves able to withstand the worst treatment this operation can provide. The extremely durable Hazaprene ZBF sheath is excellent protection against the constant scraping, twisting and dragging that is normal in this type of operation. Hazard Keystone rubber insulation and shielded construction provide long electrical life and maximum protection for personnel when handling the cables.

No matter what the type of installation, there is a Hazard cable that will handle power distribution up to 15,000 volts. Ask your Hazard representative or write Hazard Insulated Wire Works, Division of The Okonite Company, Passaic, New Jersey.

Men can carry shielded Hazacord high voltage cables with complete safety from electrical discharges.

Hazacords are known for their reliability in blasting operations such as this where there is constant threat from impact and sharp uneven surfaces.

Hazacords give long service even when dragged continuously over rough, destructive terrain like that shown here.



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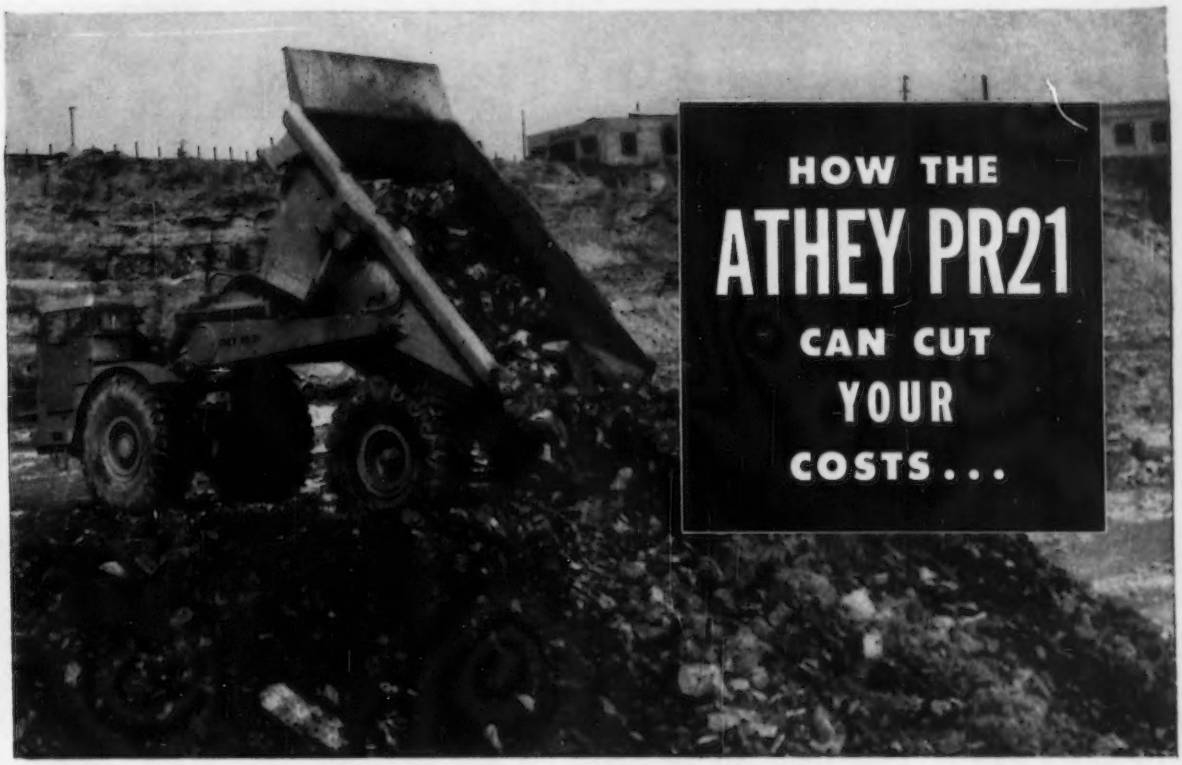

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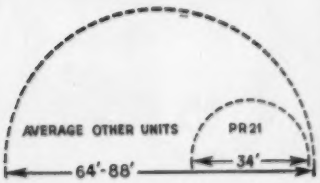

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Eliminates bogging down on fill edge.

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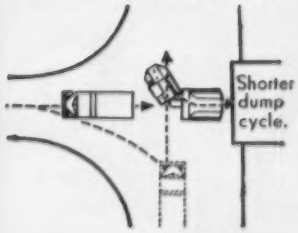
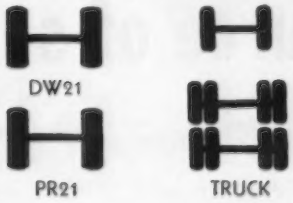


● **BETTER TRACTION AND GRADABILITY...**
Near equal weight distribution puts ample weight on drive wheels regardless of grade.

● **LESS RUBBER...**
Plus interchangeability means lower hourly cost.



● **SIMPLICITY...**
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ONLY THE ATHEY PR21 Rear Dump Trailer CAT DW21 Tractor OFFER ALL THESE MONEY-SAVING ADVANTAGES

See the complete PR21 story... send for your free copy of the booklet, "More Trips Per Hour, More Yards Per Day, More Profits Per Job", Form No. 1014. It's loaded with facts that can help you cut your costs. Write today!

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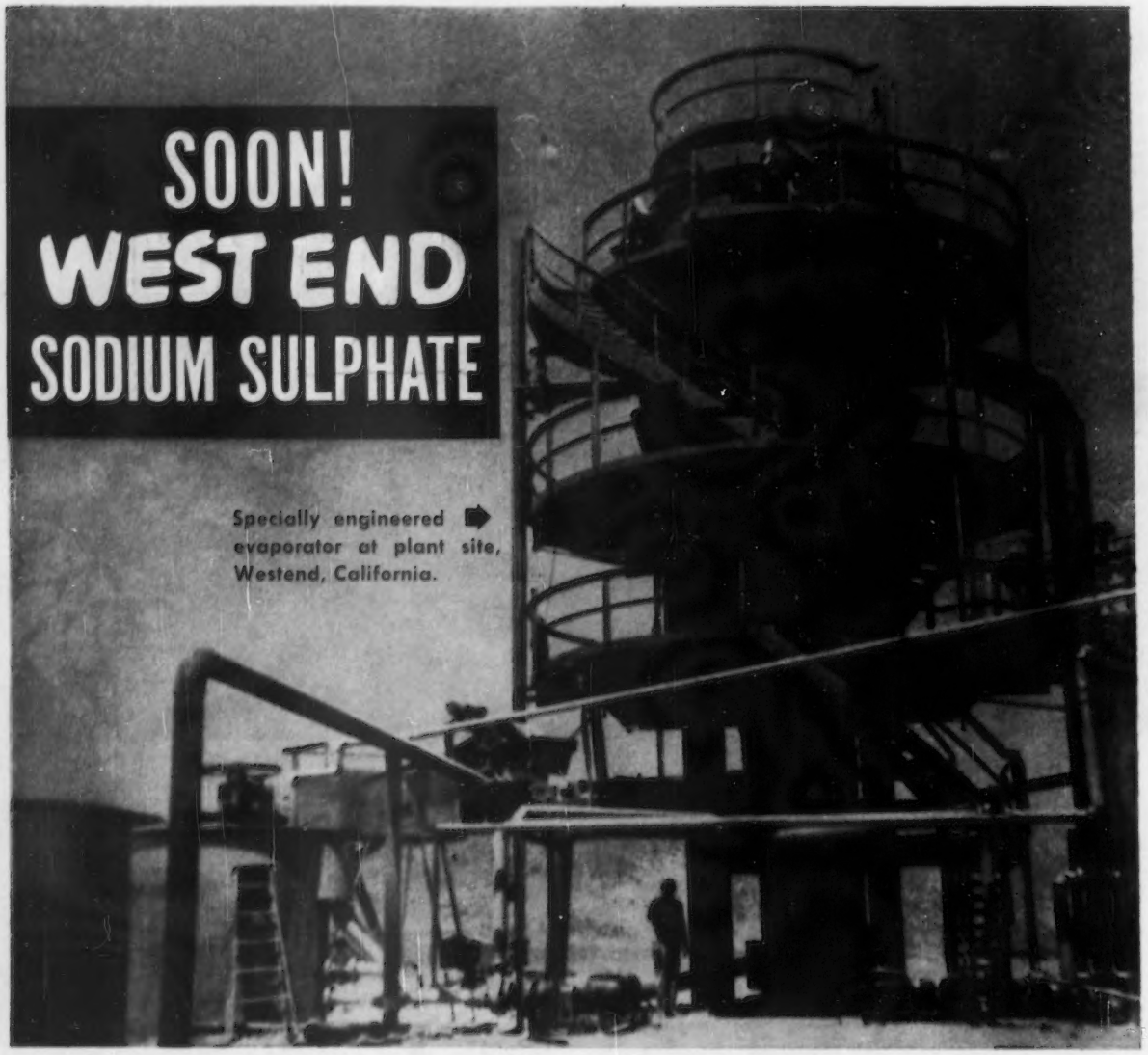

New plant now under construction to tap rich natural source of sodium sulphate

West End Chemical Company will start producing salt cake and anhydrous sodium sulphate by approximately mid-summer, 1955, at the rate of 50,000 tons annually. Output will be geared to serve the national market. Production can be stepped up at any time. The natural brine deposits at Searles Lake, California, will support a production many times this amount.

West End Sodium Sulphate and Salt Cake will be of very high quality. They will be *chemicals* produced by a chemical process in a chemical plant — not by-products.

Inquiries are invited. West End will be pleased to work out freight schedules on salt cake or anhydrous sodium sulphate to any points in the United States in quantities required.

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More than just a piece of machinery . . . a BIRDSBORO Crusher is comprised of many individually designed components skillfully engineered to help you increase crushing output and reduce costs. Get in touch with BIRDSBORO engineers today.

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Mining Guidebook

a new Engineering and

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Drilling and Blasting
Loading
Hauling
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Ground Support

3. Open-Pit Mining
Pit Planning
Drilling and Blasting
Earthmoving

4. Milling, Concentrating
Crushing
Grinding
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Magnetic Concentration
Other Concentration Methods
Mill Plant Design

5. Metallurgy
Pyrometallurgy
Chemical and Hydrometallurgy
Electrometallurgy

6. General Mine Plant Operation
Maintenance
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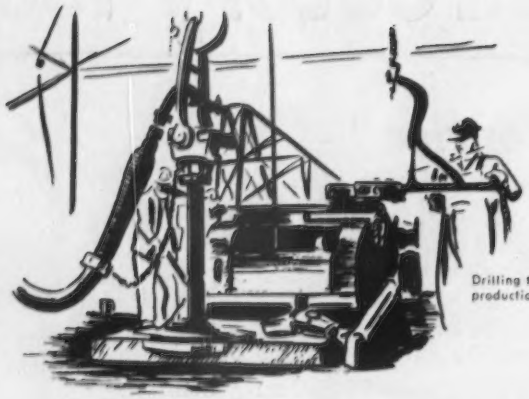

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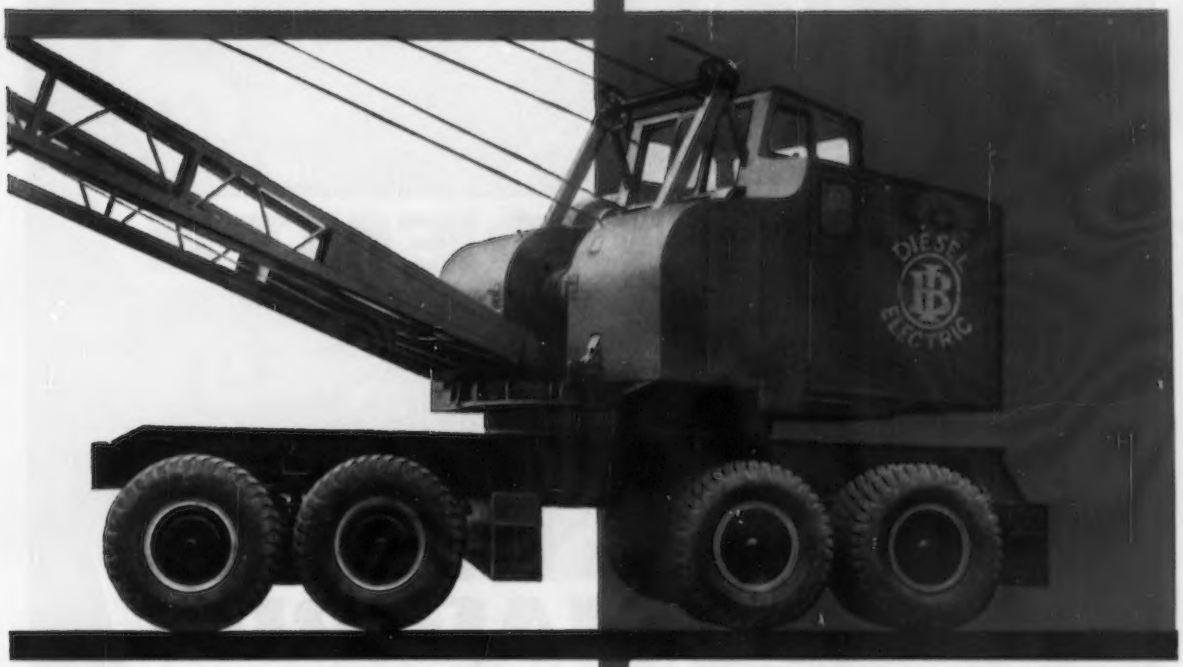

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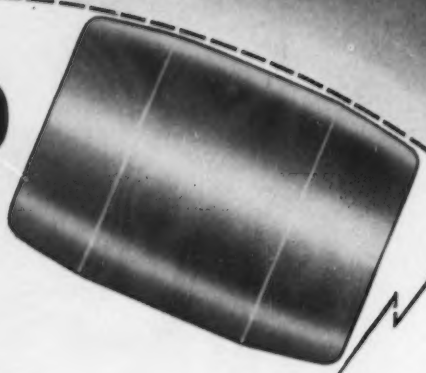
NOW... all Tru-Rol Bearings have CROWNED ROLLERS



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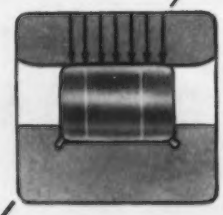

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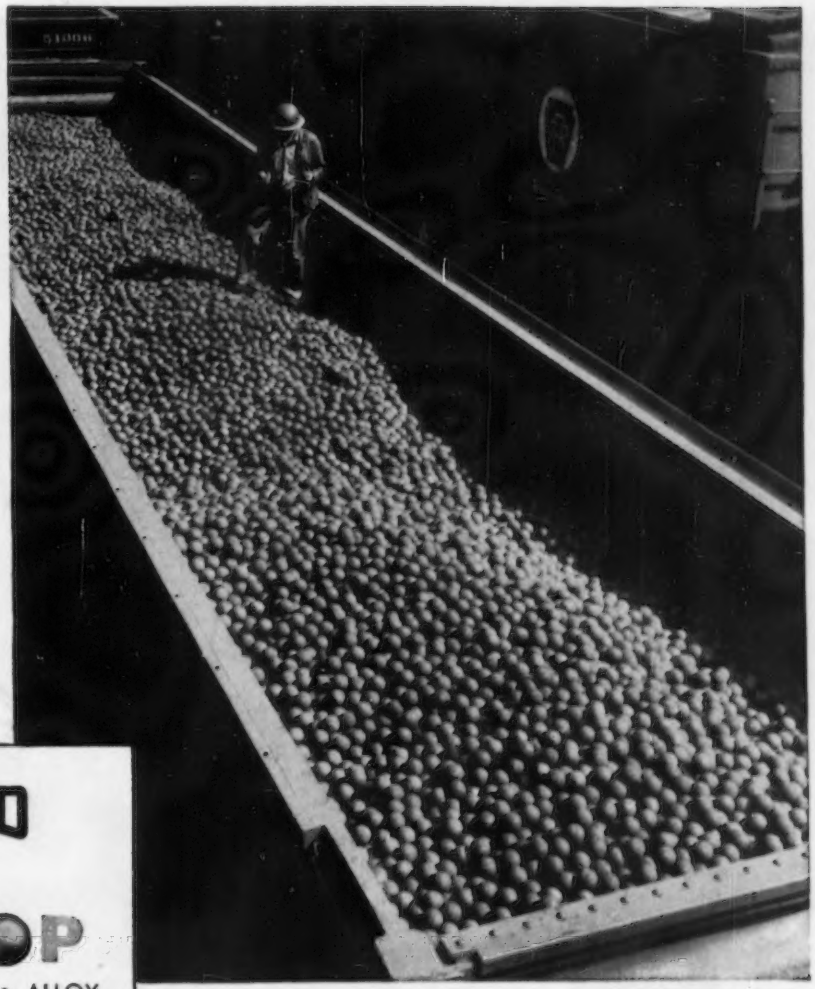

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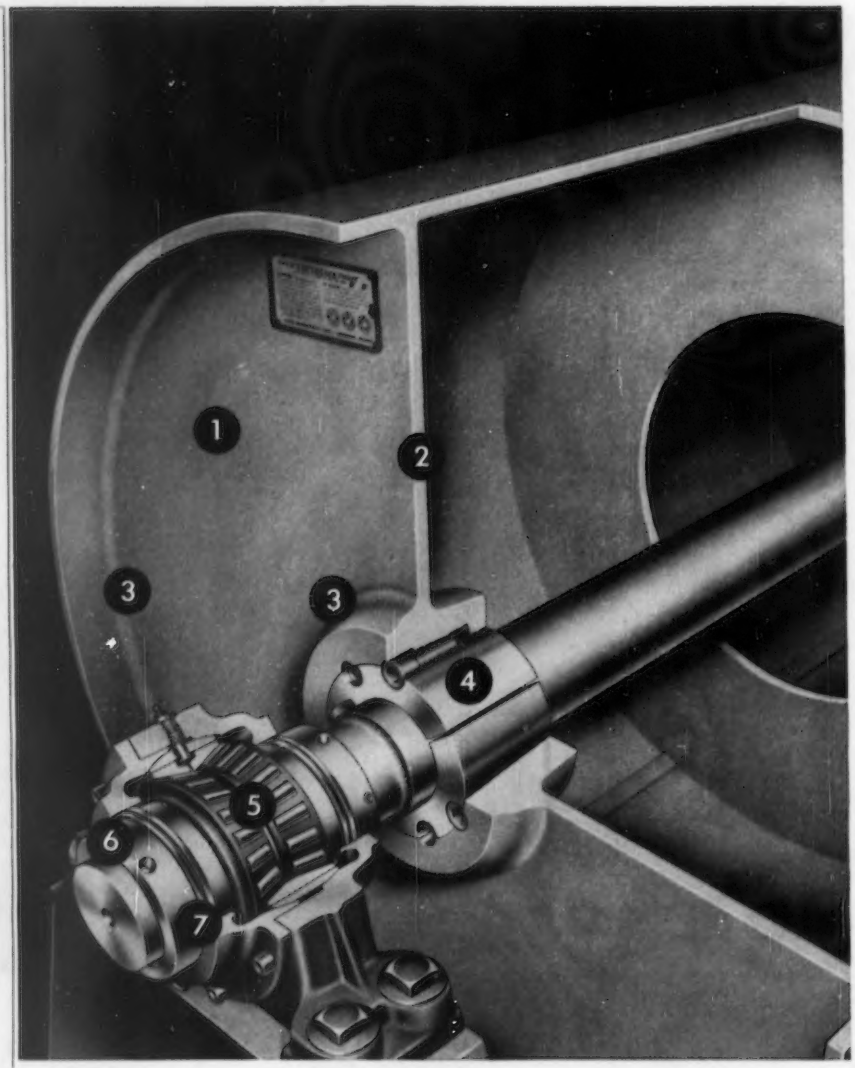

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THE WORLDS MOST EFFICIENT
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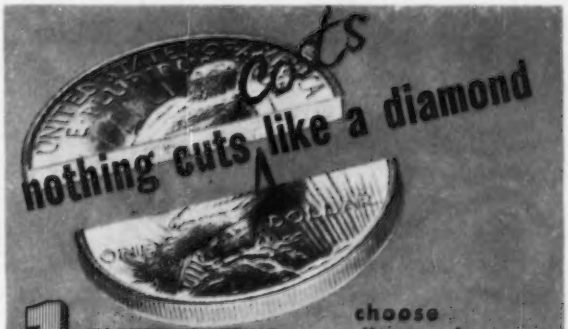

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(Continued on opposite page)

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(Continued from opposite page)

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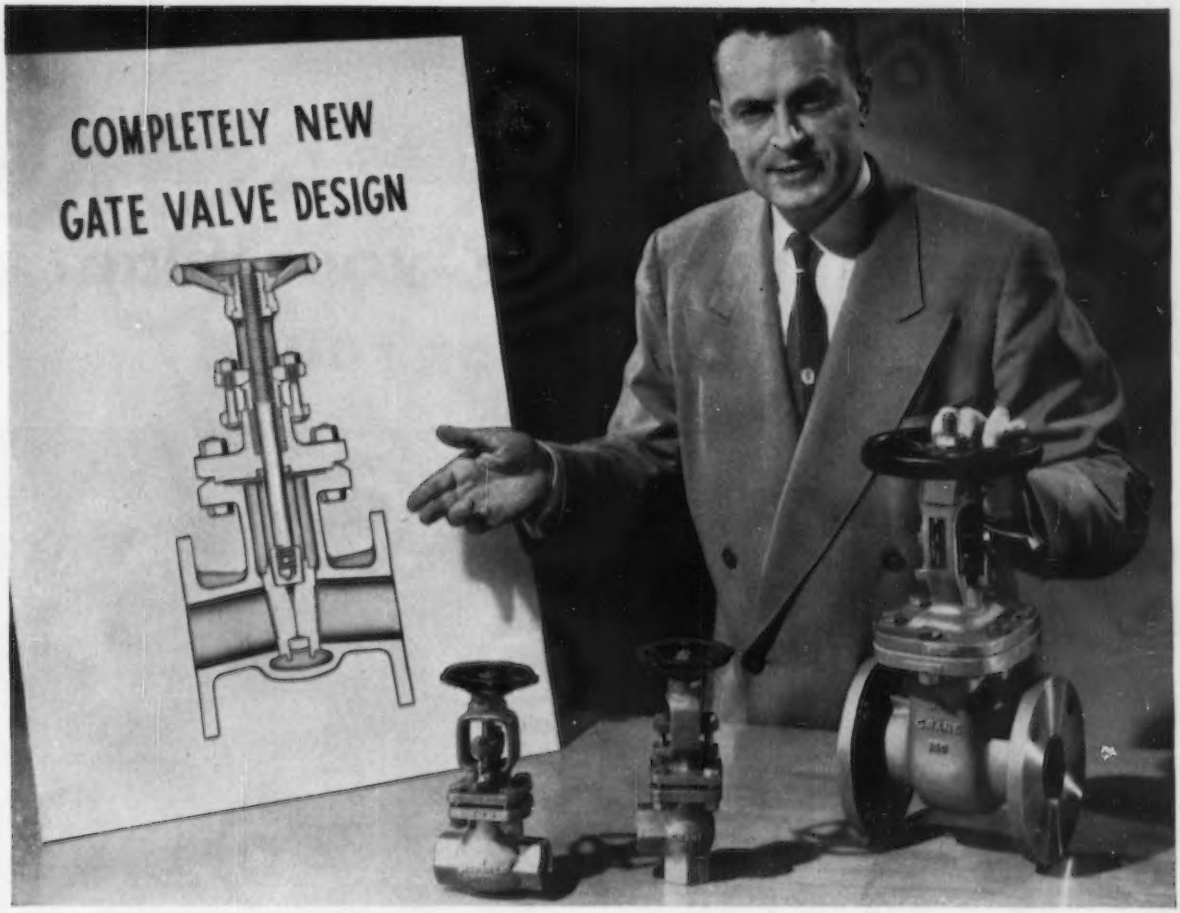

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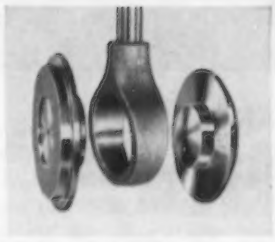

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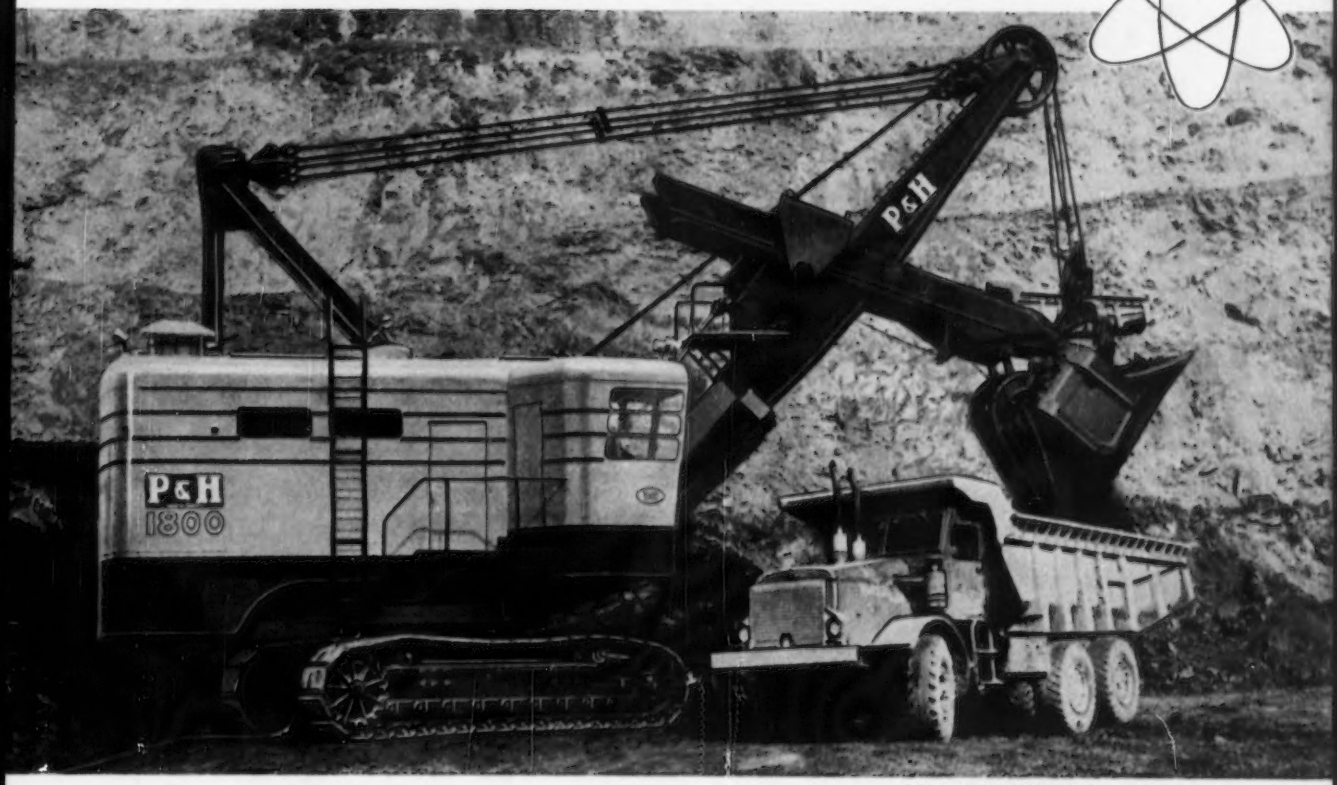

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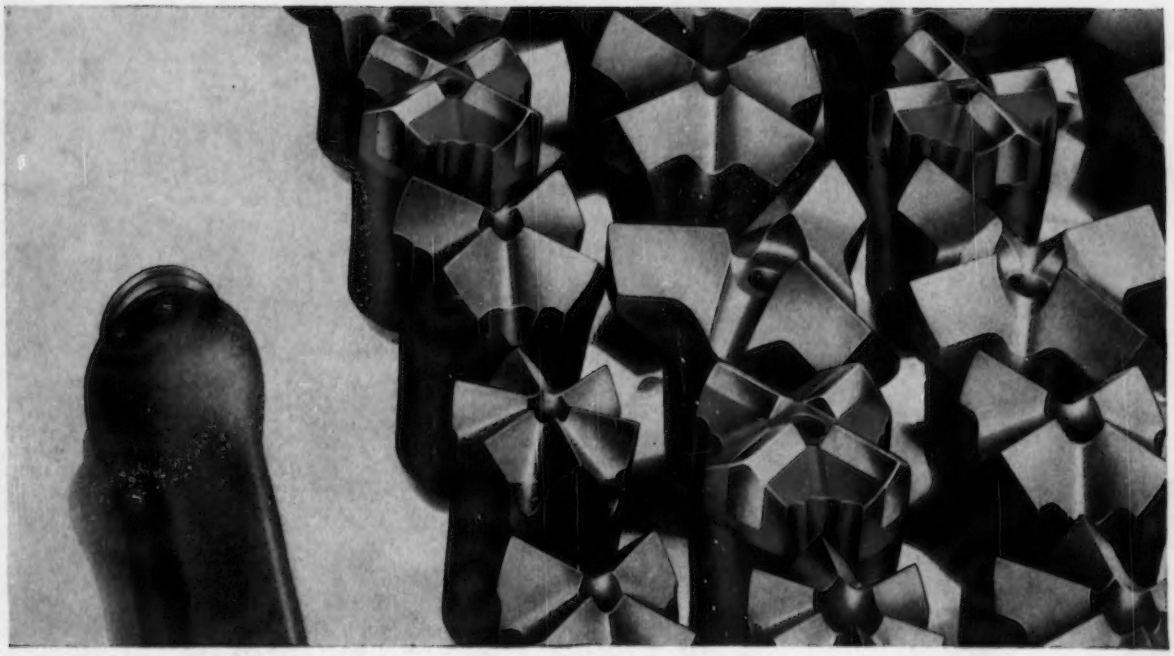

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